Another new development using

B. F. Goodrich Chemical *raw materials*

Athletic balls made by Sun Rubber Co., Barberton, Ohio. B. F. Goodrich Chemical Co. supplies the Good-rite Resin 50 only.

Adds thousands of bounces to athletic rubber balls!

Good-rite Resin 50 improves rubber durability and flex life

THE basketball pictured will come through more games undamaged and as good as new than players would have thought possible a few years ago. Its Good-rite Resin 50-improved rubber cover is rip-proof, scuff-proof, and outwears leather balls 9 to 1!

Gravel or concrete surfaces won't harm the rubber cover—whether it's on a basketball, baseball or football. The balls retain perfect shape even after lengthy use. And because they are water-and-mildew-proof, extreme weather conditions do not affect them.

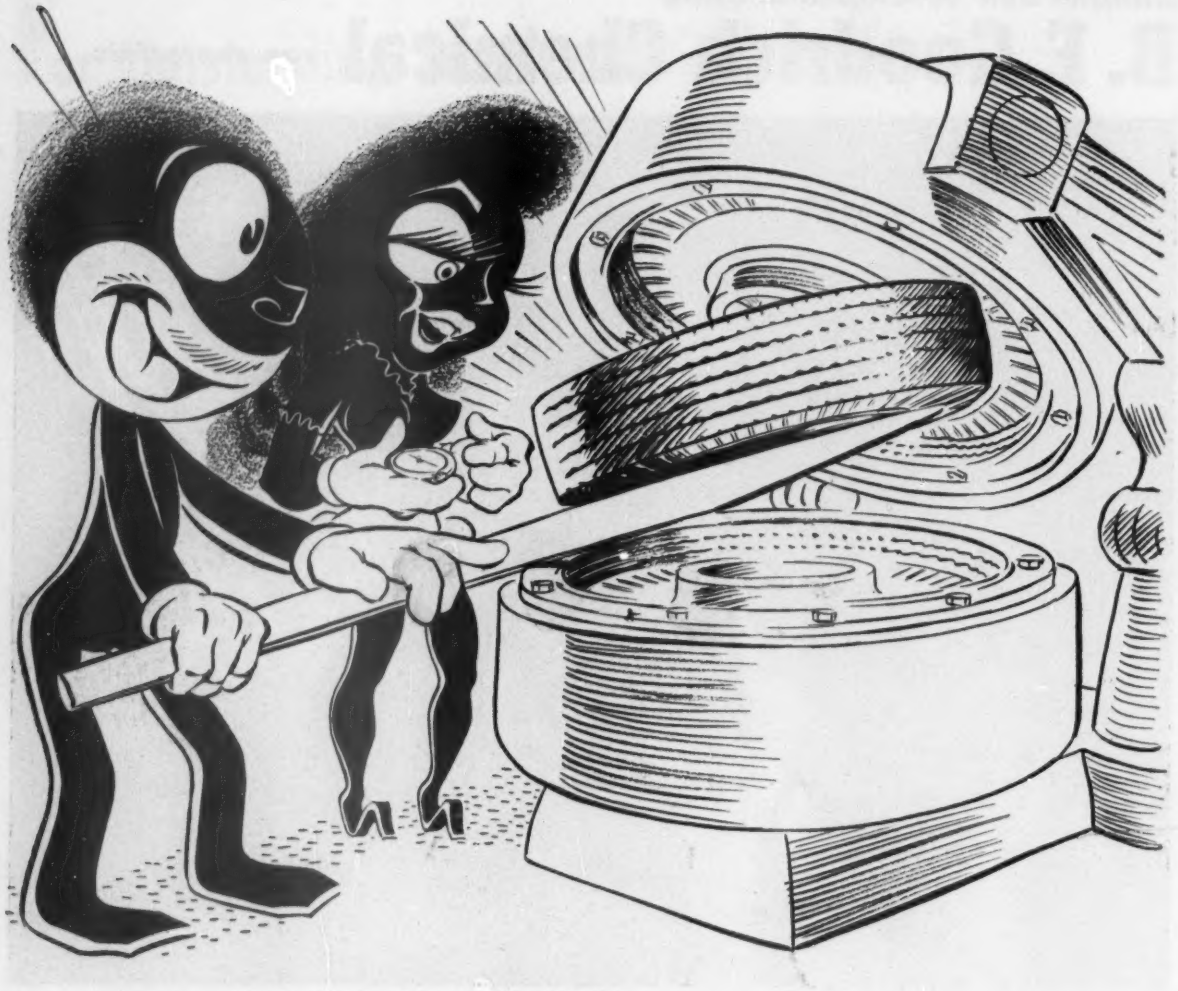
Good-rite Resin 50 helps improve many more rubber products—and makes cost-savings on rubber-compounding, too. It is an easy-processing, reinforcing and stiffening agent, compatible with crude rubber and most American rubbers. It affords a new and simple approach to hardness problems. It saves time by eliminating masterbatching. And it gives rubber compounds better flex life . . . higher elongation . . . improved abrasion resistance . . . and better handling because Resin 50 acts as a plasticizer at processing temperatures.

Good-rite Resin 50 is a white, free-flowing powder. Can be compounded in a wide range of colors. Send for helpful technical bulletin. Write Dept. CA-5, B. F. Goodrich Chemical Co., Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company
A DIVISION OF
The B. F. Goodrich Company

Good-rite
Rubber Chemicals

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors



With **Philblack*** **A** *you get, for sure, Easy processing, rapid cure!*

● Keep that production line on schedule! Easy mixing, rapid incorporation, fast processing, swift tubing, quick cure! This quick-and-easy black produces rubber stocks of high-quality appearance, good plasticity and resiliency. Imparts high abrasion resistance, low cut and crack growth, reduced chipping.

Use Philblack A in natural, GR-S, reclaim and low temperature polymers for superior physical qualities. Low heat buildup and low cost, too! Philblack technical service representatives are available to consult with and assist in compounding and processing problems. Philblack A is shipped in bags or in bulk.

PHILLIPS CHEMICAL COMPANY

PHILBLACK SALES DIVISION

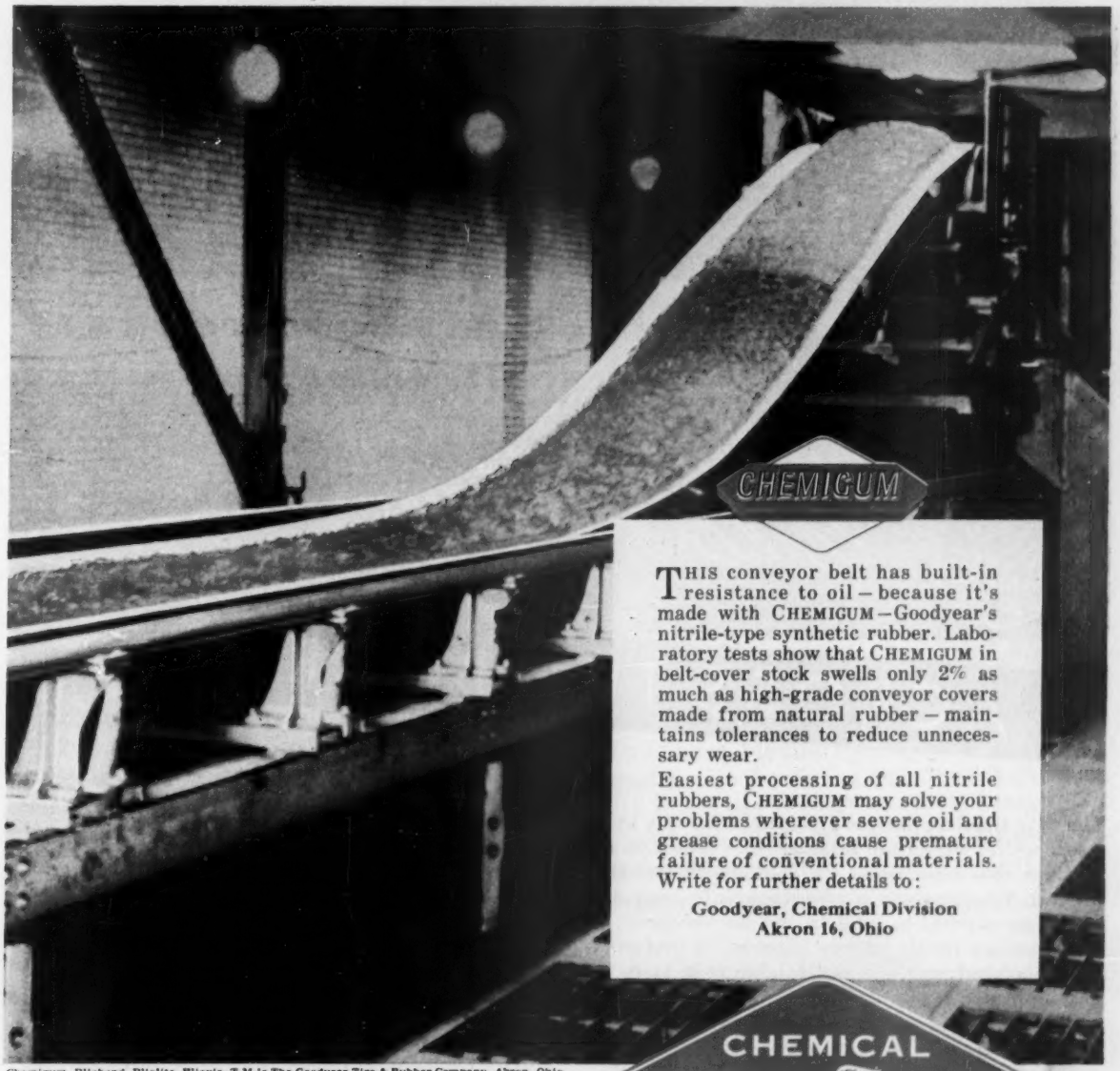
EVANS BUILDING • AKRON 8, OHIO

PHILBLACK EXPORT SALES DIVISION • 80 BROADWAY • NEW YORK 5, N. Y.

* A Trademark

Philblack A and Philblack O are manufactured in Borger, Texas. Warehouses in Akron, Boston, Chicago and Trenton.
West Coast agent: Harwick Standard Chemical Company, Los Angeles. Canadian agent: H. L. Blachford, Ltd., Montreal and Toronto.

This conveyor handles oil-treated fuel—and lasts longer because it's made with CHEMIGUM



THIS conveyor belt has built-in resistance to oil—because it's made with CHEMIGUM—Goodyear's nitrile-type synthetic rubber. Laboratory tests show that CHEMIGUM in belt-cover stock swells only 2% as much as high-grade conveyor covers made from natural rubber—maintains tolerances to reduce unnecessary wear.

Easiest processing of all nitrile rubbers, CHEMIGUM may solve your problems wherever severe oil and grease conditions cause premature failure of conventional materials. Write for further details to:

Goodyear, Chemical Division
Akron 16, Ohio

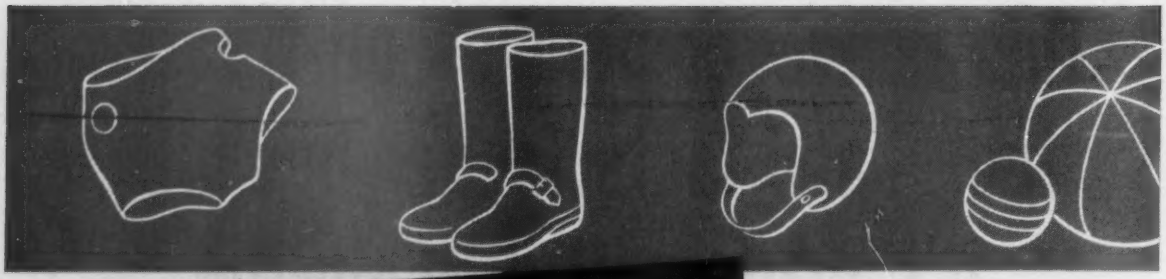
Chemigum, Pliobond, Pliolite, Pliovic—T.M 's The Goodyear Tire & Rubber Company, Akron, Ohio

This conveyor belt—designed to handle oil-treated fuels—is built with special CHEMIGUM *cover and* CHEMIGUM *Friction Compounds to insure maximum oil resistance and longer service.*

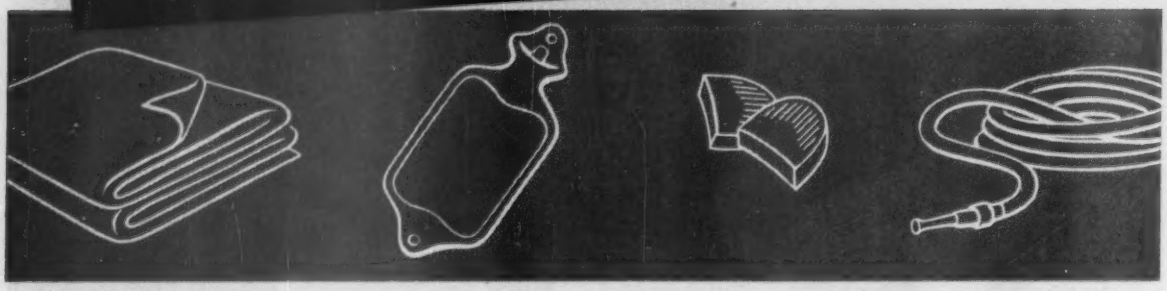
CHEMICAL GOODYEAR DIVISION

We think you'll like "THE GREATEST STORY EVER TOLD"—Every Sunday—ABC Network

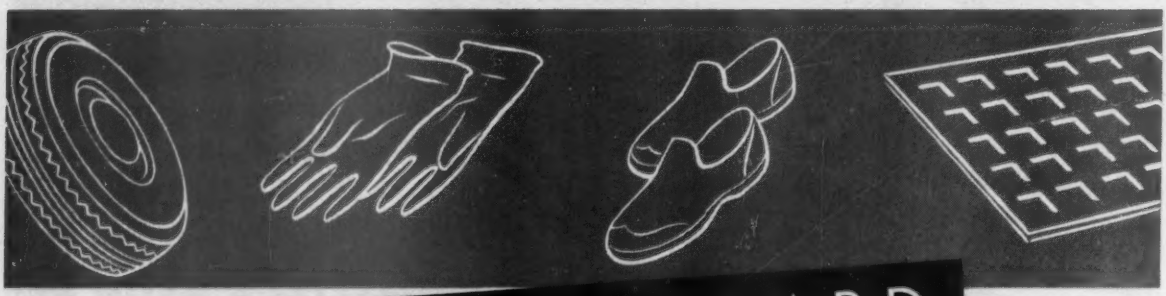
Use Proved Products—CHEMIGUM • PLIOBOND • PLIOLITE • PLIOVIC • WING-CHEMICALS—The Finest Chemicals for Industry



TITANOX *means*



whiter...brighter rubber products



ACROSS THE BOARD

The pure titanium dioxide pigments, TITANOX-A and TITANOX-RA assure whiter whites and brighter color tints with minimum loadings, thus maintaining the desirable characteristics of your product. TITANOX-RA-NC is advantageous in compounds which are exposed to sunlight and the weather. TITANOX-RCHT (rutile-calcium pigment) is preferred for economical whiteness and brightness in more heavily loaded stocks. Its finely divided pigment and extender promote normal aging and resist discoloration.

Our Technical Service Department is ready at any time to discuss your individual rubber pigmentation problems with you. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; Boston 6; Chicago 3; Cleveland 15; Los Angeles 22; Philadelphia 3; Pittsburgh 12; Portland 9, Ore.; San Francisco 7. In Canada: Canadian Titanium Pigments, Ltd., Montreal 2; Toronto 1.

8970

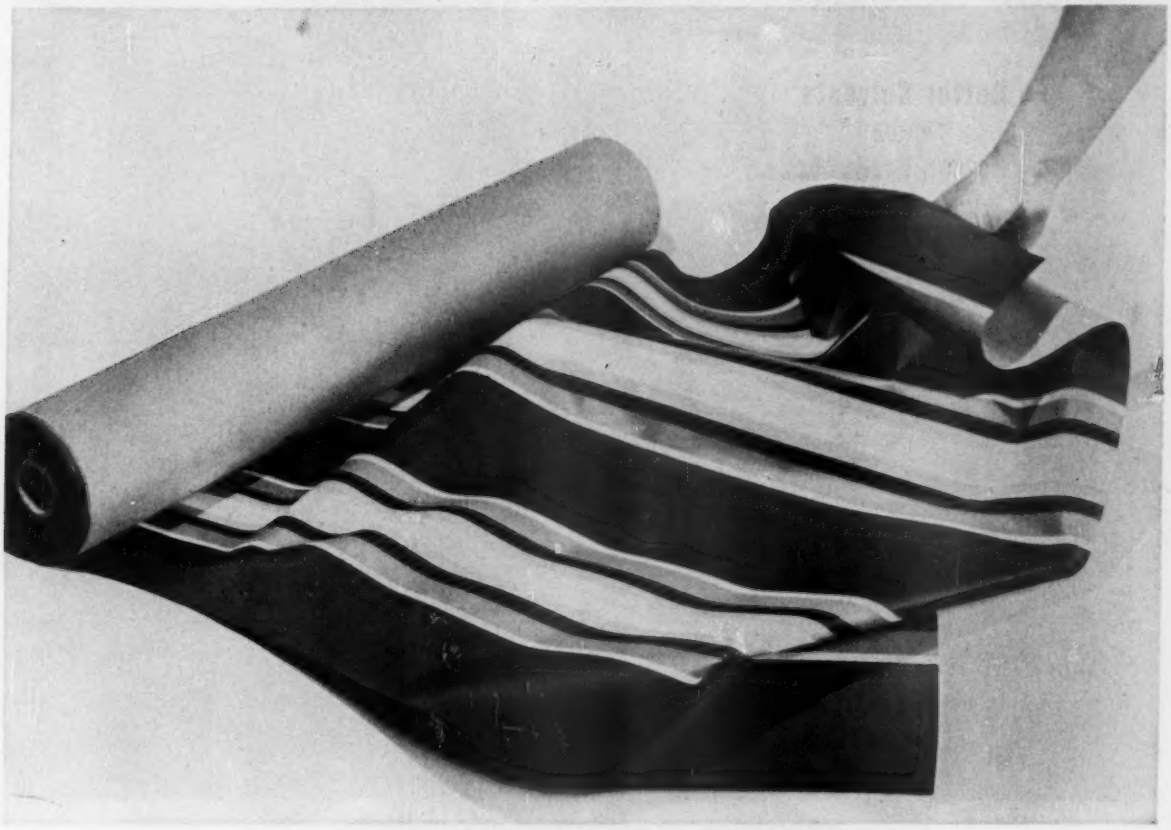
® **TITANOX**

the brightest name in pigments

TITANIUM PIGMENT CORPORATION

Subsidiary of **NATIONAL LEAD COMPANY**

Soft hand and casual drape characterize this PLIOVIC *coated fabric manufactured by the Graniteville Manufacturing Company, Graniteville, S. C.*



BETTER TEXTILE COATINGS—

when your vinyl dispersions are made with PLIOVIC

TEXTILE manufacturers everywhere are relying on PLIOVIC – Goodyear's vinyl for use either in organosol, plastisol or latex dispersions. Such coatings when used on textile materials have these outstanding advantages:

1. Lower fusing temperatures 2. Less discoloration 3. Higher gloss 4. Greater clarity 5. Lower water sensitivity

PLIOVIC gives you production advantages, too. Fusing temperatures are from 25°-50° lower—protection against scorch and damage to base fabrics. You need less costly plasticizer with PLIOVIC—and can disperse the resin in less time using standard equipment.

If you have a textile coating problem—or want assistance in developing new finishes and products, it will pay you to investigate PLIOVIC. Ask a Goodyear Chemical Division representative for details, or write:

Goodyear, Chemical Division, Akron 16, Ohio

CHEMICAL GOODYEAR DIVISION

Chemigum, Pliobond, Pliolite, Pliovic—T.M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

Use Proved Products — CHEMIGUM • PLIOBOND • PLIOLITE • PLIOVIC • WING-CHEMICALS — The Finest Chemicals for Industry

Experiments sometimes cause trouble...

Skellysolve for Rubber and Related Industries

Applications

SKELLYSOLVE B. For making quick-setting cements for the shoe, tape, container, tire and other industries. Quick-drying, with no foreign taste or odor in dried compound.

SKELLYSOLVE C. For making quick-setting cements with a somewhat slower drying rate than those compounded with Skellysolve B.

SKELLYSOLVE D. For cements and variety of manufacturing operations. Good odor. Quick drying. Minimum of heavy, greasy compounds.

SKELLYSOLVE H. For general use in manufacturing operations and cements, where faster evaporation rate than that of Skellysolve D is desired.

SKELLYSOLVE E. For use wherever a relatively slow drying solvent is desired.

SKELLYSOLVE R. For general use in tire building and a variety of other manufacturing operations and cements. Reduces evaporation losses. Medium quick final dry. Lessens bloating and skinning tendency.

"DOC" MacGEE SAYS: Why risk unnecessary experiments by trying out something "just as good as" Skellysolve. You take no chances with the quality of your product or of balling up your plant operations when you standardize on Skellysolve—a fact that's been proved over and over again for more than 20 years.

First of all, Skellysolve is noted for its uniformity. Every batch has the same over-all properties to protect your *product's* high quality . . . to fortify its sales appeal, as well as to give trouble-free operations in your plant. Skellysolve's uniformity is assured by strict laboratory controls, unsurpassed manufacturing methods, and the "will to do" that stems from pioneering and major product operations. Skellysolve is not a "side-line" venture.

Test Skellysolve for every feature that is important to you. Check its low end point, quick evaporation, low vapor pressure, its minimum of unsaturates and pyrogenic decomposition products.

See why Skellysolve's minimum of low and high boiling compounds means reduced rejects due to blushing and blisters. Note the controlled vapor pressure to guard against bloated containers. What's more, the minimum of low boiling compounds means no "seeds" in rubber cements . . . with high bonding strength assured by freedom from greasy residues.

For more complete technical facts, write now. And ask about special help on solvent applications from the Skellysolve Technical Fieldman.

SKELLY

Skellysolve

SOLVENTS DIVISION, SKELLY OIL COMPANY
KANSAS CITY, MISSOURI

No water extraction
Best color retention
Positive antioxidant protection

with *Wing-Stay S*

IN FISHING lures, bathing caps, surgeons' gloves—wherever light-colored or white rubber products are washed, sterilized or just immersed in water – it pays to use WING-STAY S for antioxidant protection. For under ordinary conditions, this antioxidant is *never* removed by water. This assurance of lasting protection is coupled with the best color retention – all at surprisingly low cost.

If you are now using any of these GR-S rubbers—1006, 1012, 1502 or X693 – you already have these advantages of WING-STAY S working for you. For since August 1951, more nonstaining GR-S has been made with WING-STAY S than with all other antioxidants combined.

You can safely turn to this use-proved antioxidant, thanks to large production facilities that assure you of a dependable supply. Write for further details to:

Goodyear, Chemical Division, Akron 16, Ohio

CHEMICAL
GOODYEAR
DIVISION

Chemigum, Pliobond, Pliolite, Pliovic, Wing-Stay—
T.M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

Use Proved Products — CHEMIGUM • PLIOBOND • PLIOLITE • PLIOVIC • WING-CHEMICALS — The Finest Chemicals for Industry

GET GREATER PRODUCTION FASTER

In Your Tile Processing with

SOLKA®-FLOC

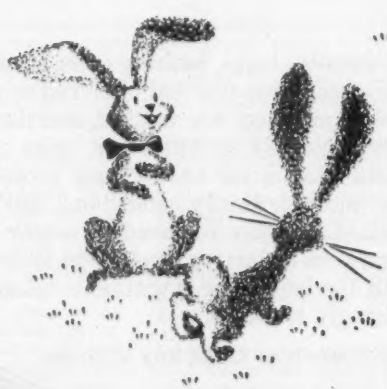
GREATER, FASTER PRODUCTION through easier processing can be yours with SOLKA-FLOC. Just use 20 volumes of SOLKA-FLOC to replace an equal volume of mineral filler.

Reduced blistering . . . controlled shrinkage . . . reduced nerve . . . sharper designs . . . harder, smoother surfaces are other results frequently obtained with SOLKA-FLOC.

SOLKA-FLOC—the purest, softest, whitest, strongest and most absorbent of wood cellulose fibres—has found wide application in the rubber field. As a processing aid in the manufacture of such products as tiling, soling, matting, molded goods, extruded goods, etc., it is unequalled for performance.

Learn more about the use of SOLKA-FLOC in processing. Write for recommendations and samples to Technical Service, Dept. GF-10 at Boston.

Prompt shipment guaranteed—pounds to carloads.



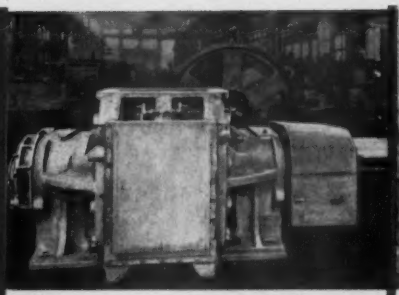
BROWN COMPANY, Berlin, New Hampshire

BROWN CORPORATION, La Tuque, Quebec

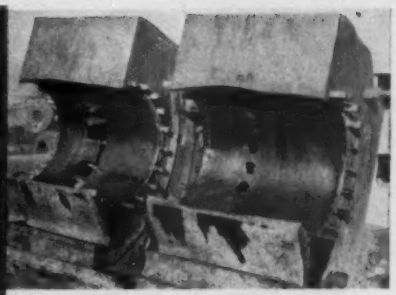
General Sales Offices: 150 Causeway St., Boston 14, Mass.—Dominion Square Bldg., Montreal, Quebec

SOLKA & CELLATE PULPS • SOLKA-FLOC • NIBROC PAPERS • NIBROC TOWELS • NIBROC KOWTOWELS
BERMICO SEWER PIPE, CONDUIT & CORES • ONCO INSOLES • CHEMICALS

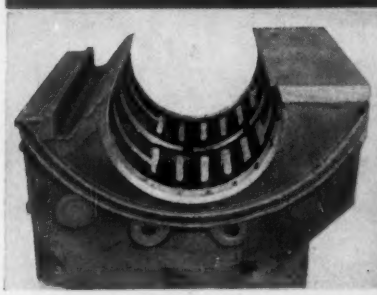
Here's how EXPERTS rebuild your BANBURY



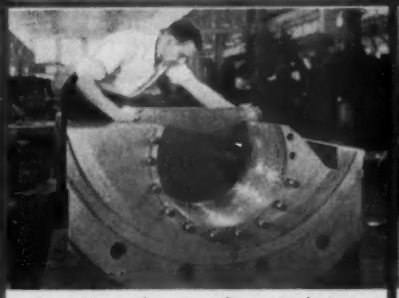
1 As soon as a worn Banbury is received, it is cleaned, dismantled, thoroughly inspected, and magnafluxed for hidden cracks.



2 These sides are very badly worn, but our experts can repair them by inserting new liners.



3 This side has been bored — ready for a new liner to be welded in.

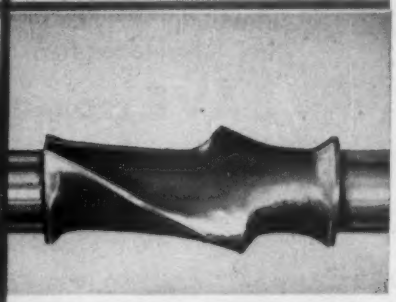


4 Now the new liner is being gauged after having been ground to exact size. The side is now as good as new.

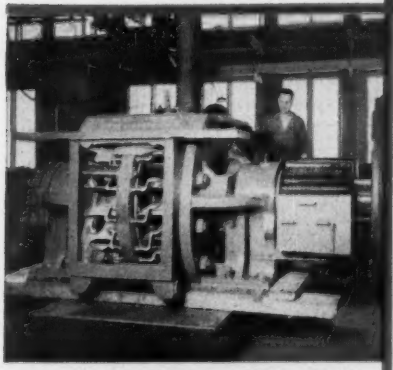
5 Here's a candid shot of a worn rotor. Looks bad — but it's not hopeless.

6 Now the entire rotor has been built up to full original size.

7 With necks rough-machined and body rough-ground, this rotor is now well on the way toward a new life.



8 Here's the rotor with its "new look," all ready for plenty of hard work.



9 And here is the complete rebuilt body, reassembled, tested and ready to leave the shop carrying a new-machine guarantee.

These operations on two of the larger parts are just a few examples of how thoroughly a Banbury mixer body is rebuilt at Farrel-Birmingham. End frames, door top and cylinder, dust stops, thrust collars, connecting gears, and all the other parts also receive careful examination and are either restored to "good-as-new" condition, or, if necessary, replaced.

This work requires the skill, experienced "know-how" and special facilities found only where Banbury mixers are built originally. Why take less than the best? The high quality of Farrel-Birmingham's Banbury repair work cannot be matched at lower prices — or at any price, for that matter.

For complete details, write, wire or phone one of the offices listed below.

FB-771

FARREL-BIRMINGHAM COMPANY, INC.

Farrel-Birmingham®

ANSONIA, CONN. (Telephone Ansonia 4-3331)
AKRON, OHIO, 2710 First National Tower (Tel. Jefferson 3149)
CHICAGO, ILLINOIS, 120 So. LaSalle Street (Tel. Andover 3-6434)
LOS ANGELES, CALIF., 2032 Santa Fe Avenue (Tel. Lafayette 3017)
HOUSTON, TEXAS, 860 A M & M Building (Tel. Preston 4472)

HOW TO- SAVE PRODUCTION DOLLARS with PROTOX* ZINC OXIDES...

The patented coating of zinc propionate on Protox oxides provides outstanding advantages that cut your production costs these 5 ways:

SAVE STORAGE COSTS

You save 33% of space with Protox; it has lower bulking.

SAVE HANDLING COSTS

You can buy Protox in unit-load cars. You save inter-plant hauls by loading more Protox per truck.

SAVE PRODUCTION COSTS IN HUMID WEATHER

You process Protox faster; it has less moisture pickup.

SAVE ZINC MASTERBATCHING COSTS

You cut out this step with Protox; it has excellent dispersion.

SAVE BANBURY COSTS

You mix Protox faster; rubber wets it quicker.
You mix larger batches; Protox bulks 33% less.

How much can *you save* with Protox zinc oxides?
The best way to find out is to order a plant batch today.

*U. S. Patents 2,303,329 and 2,303,330.

THE NEW JERSEY ZINC COMPANY

Producers of Horse Head Zinc Pigments
. . . most used by rubber manufacturers since 1852

160 Front Street, New York 38, N. Y.

White walls are back

and UNITANE® O-220

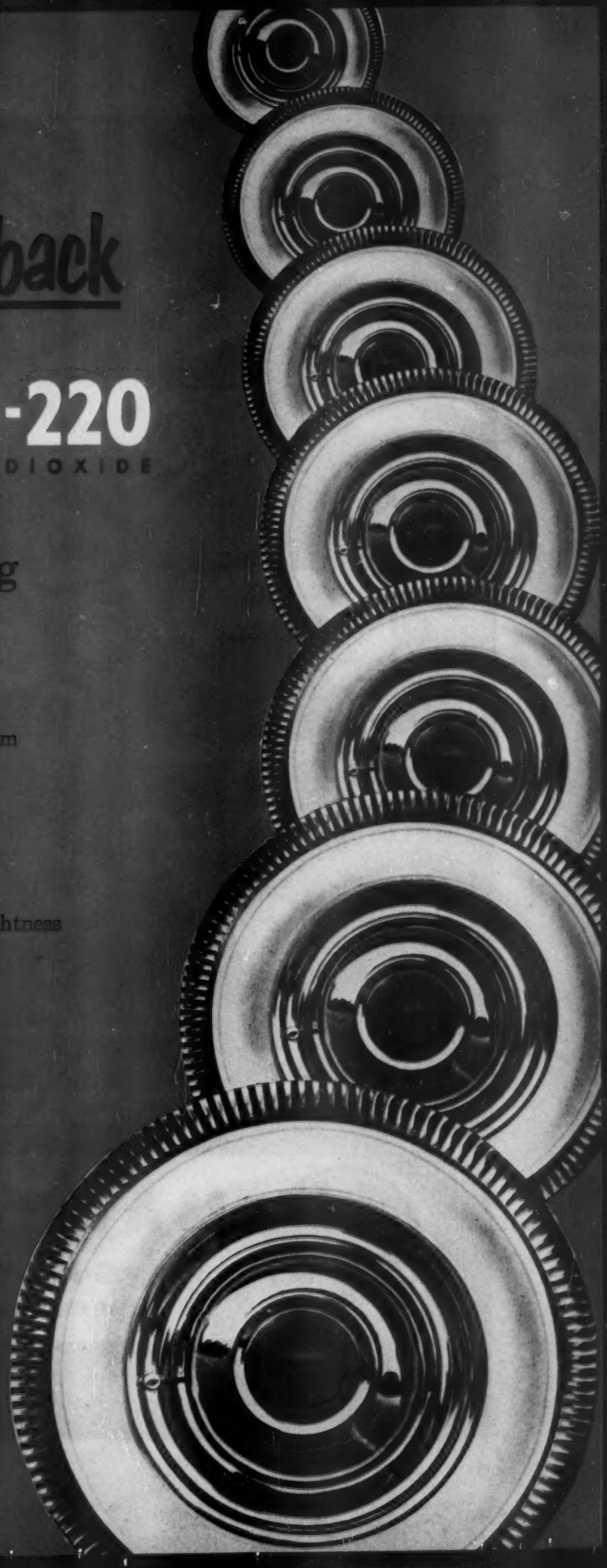
TITANIUM DIOXIDE

is available for maximum whitening at minimum cost

You secure maximum whitening with minimum loading—and minimum cost—in your rubber products with UNITANE O-220.

Specify it for brilliance in white and tinted articles. And—it gives that clean, snappy brightness to white side-wall stock.

Your Calco representative will gladly advise you on the grade of UNITANE best suited to your needs.



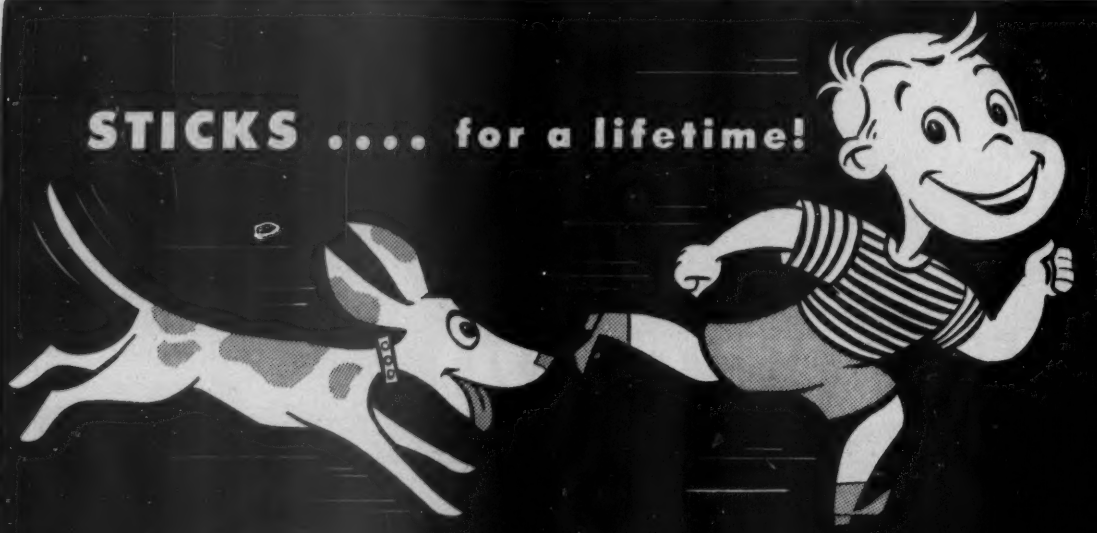
Calco

AMERICAN Cyanamid COMPANY

CALCO CHEMICAL DIVISION
PIGMENT DEPARTMENT
BOUND BROOK, NEW JERSEY

BRANCH OFFICES AND WAREHOUSES IN PRINCIPAL CITIES

STICKS .... for a lifetime!



TY·PLY

the Dependable Rubber-to-Metal Adhesive

TY-PLY **Q** or **3640** for bonding Natural, GR-S, and Butyl

TY-PLY **S** for bonding Neoprene

TY-PLY **BN** for bonding N-types

TY-PLY will adhere most vulcanizable rubber compounds to almost any clean metal surface

Marbon

MARBON CORP.

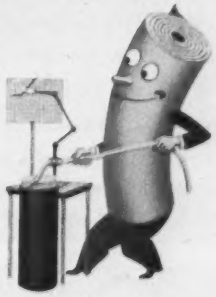
GARY, INDIANA

SUBSIDIARY OF BORG-WARNER

TY-PLY has stood the test of time . . . . since '39

MT. VERNON FABRICS

Give You Greater Fabric Uniformity



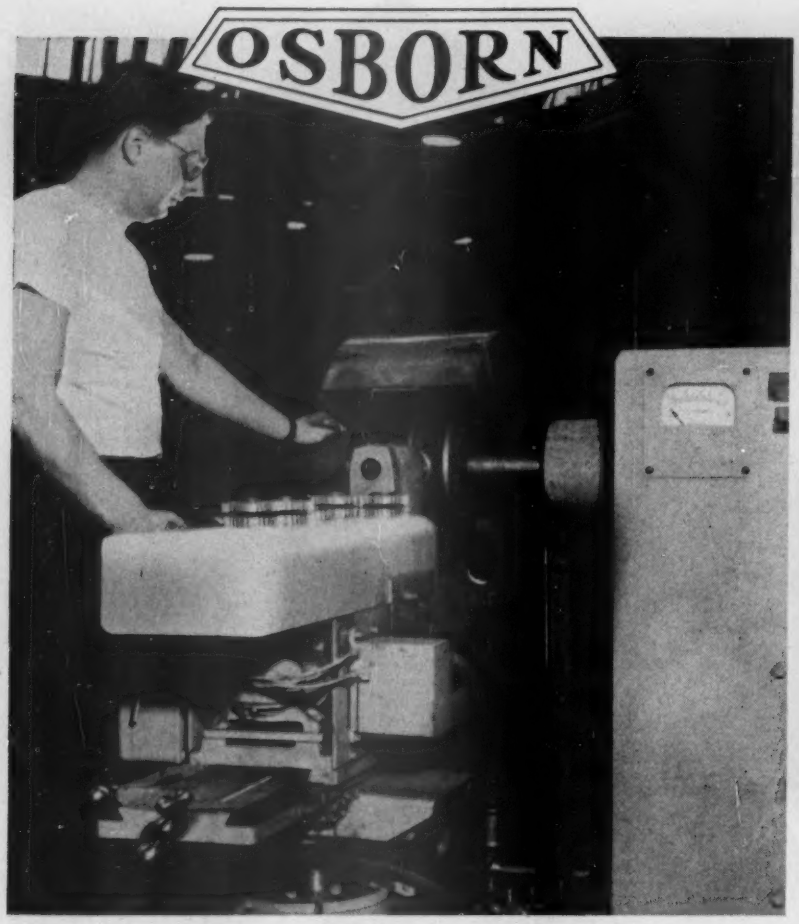
Shown is one of a series of comprehensive laboratory controls throughout production to assure uniformity in all Mt. Vernon-Woodberry products. Here evenness of sliver is being checked with linear regularity tester.

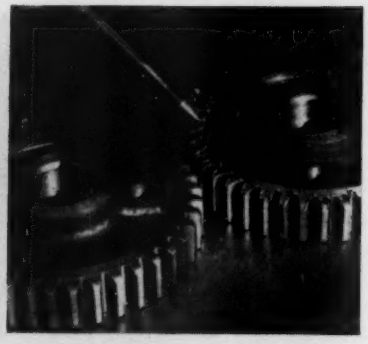
Mt. Vernon-Woodberry Mills

Branch Offices: Chicago • Atlanta • Baltimore • Boston

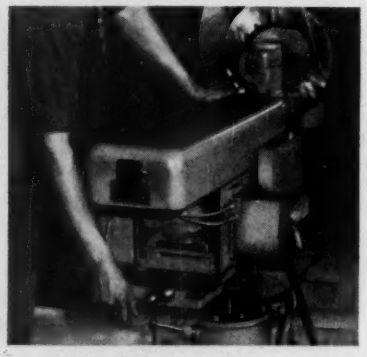
TURNER HALSEY COMPANY
Selling Agents
40 WORTH ST NEW YORK

Los Angeles





RESULTS ARE UNIFORM. Burrs and sharp edges are removed uniformly. Every gear has smooth, uniform, rounded edges. Surfaces are blended. These gears were deburred on the machine shown at the left.



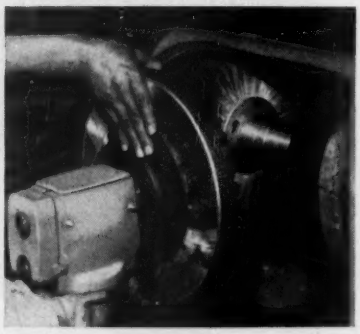
SET-UP IS SIMPLE. The machine is highly adaptable where production involves either large runs of a few parts or small runs of many different types and sizes of gears. Machine setups may be quickly made by unskilled operators. The complete brushing cycle is controlled automatically by the electronic timer which is set for any desired brushing interval to suit the size, shape or condition of part being brushed.

Formerly 20... now deburrs 125 per hour

A new machine . . . the Osborn Work Holder Brushing Lathe . . . now deburrs gears and similar parts *at the push of a button!*

In the plant of Caterpillar Tractor Co., this automatic machine deburrs and finishes gear teeth *six times as fast* as the former hand method. Production now is 125 gears per hour. Output formerly was 20. Burrs and sharp edges are now removed uniformly. Every gear tooth has smooth, rounded edges and surfaces are blended.

Find out how you can speed deburring and improve product quality with this versatile Osborn machine. Call your **O**sborn **B**rushing **A**nalyst today or write *The Osborn Manufacturing Company, Dept. 855, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

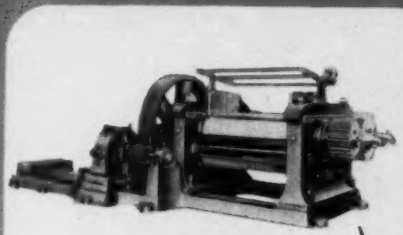


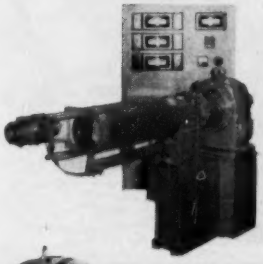
OPERATION IS SPEEDY. The operator mounts the gear easily and quickly. The gear advances to the face of two rotating Osborn brushes and the edge of the gear teeth makes contact with the brushes. To assure fast, positive action on each piece brushed, an automatic control reverses the direction of brush rotation on every cycle of operation. This machine deburrs 14-inch hypoid gears in 1½ minutes compared to 25 minutes for former method.

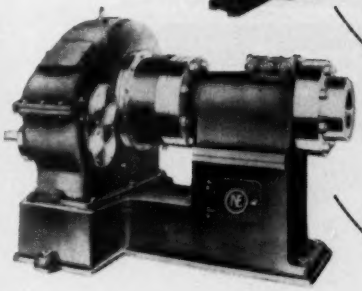
INVESTIGATE IT TODAY
for *your* problems. Users report time savings ranging from 20% to 1570% with the Osborn Work Holder Brushing Lathe. Let us demonstrate what it can do for you!

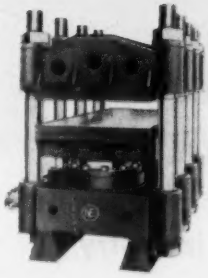
Osborn Brushes

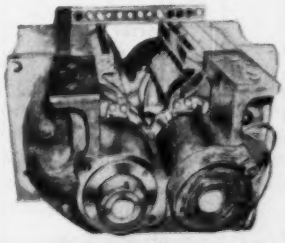
OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES











SPECIALISTS IN PROCESSES and EQUIPMENT FOR RUBBER AND PLASTICS

We are currently supplying the "know how" and ALL the equipment for processes which involve the following basic machines:

MILLS AND REFINERS

This 22" x 22" x 60" Rubber Mill is typical of National Erie heavy Milling equipment now in extensive use in the industry. Available in all sizes.

EXTRUDERS FOR PLASTICS

Advanced design National Erie units are available with all necessary equipment to form complete production processes.

EXTRUDERS FOR RUBBER

National Erie Tubers have been developed through years of experience into heavy-duty, trouble-free machines for continuous, efficient production.

HYDRAULIC PRESSES

Self-contained, oil hydraulic press and pump unit 48" x 72" for laminated plastics. Complete line of presses available from National Erie Designs.

BANBURY REBUILDING

We have an inventory of all parts for your Banbury and can give prompt service on rebuilding. If you anticipate Banbury repair work, call on us—we shall be glad to inspect your mixer and submit a detailed report of its condition, together with requirements for rebuilding.

complete service on National Erie Equipment

NATIONAL ERIE STAFF JOINS HALE AND KULLGREN, INC.

The engineering organization of National Erie, including personnel, drawings and records, have transferred to the offices of Hale and Kullgren, Inc., at 613 East Tallmadge Avenue, Akron, Ohio, and are available to you for prompt service on your processing problems. Complete service on parts and information for all existing National Erie equipment is available.

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HALE AND KULLGREN INCORPORATED

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THE AETNA-STANDARD ENGINEERING CO.
PITTSBURGH, PA.

Plants in Warren, Ohio
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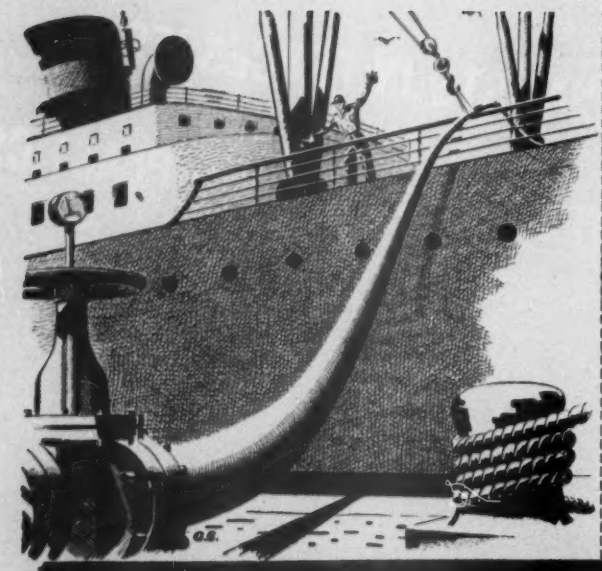

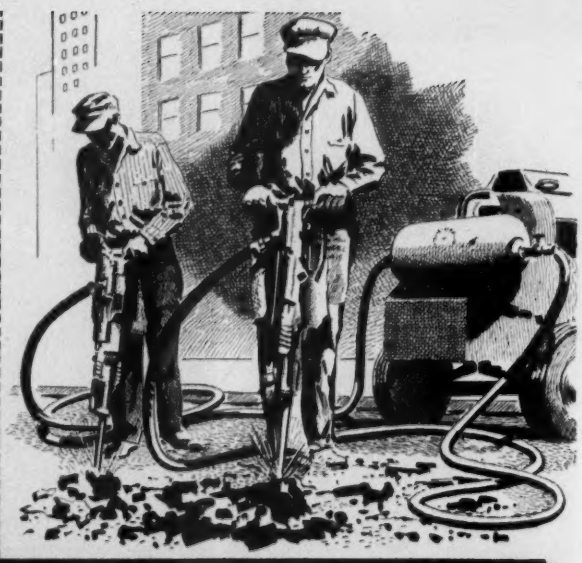

If it's got to lead a FLEXIBLE LIFE...

make it "SHAWMUT HOSE DUCK"

another Wellington Sears fabric for the rubber industry

A flexible life . . . and a long and satisfactory one! That's the basic result story of Shawmut Hose Duck, proven in a wide variety of rubber-and-fabric applications.

Especially suited for rubberized hoses for liquids and compressed air, this duck is a soft, open, plied-yarn cotton fabric affording flexibility and good impregnation. It is available in many standard, as well as non-standard, constructions to meet specific requirements.

Shawmut Hose Duck is but one of the many famous Wellington Sears cotton ducks for hoses, belting and other mechanical rubber products. Available from this "headquarters for industrial fabrics," for example, are Dredge Sleeve Duck for large suction hoses and Superior Army Duck widely used as a cover fabric for V-belts.

Based on its 100-year experience in heavy duty fabrics, Wellington Sears also offers fabrics incorporating the unique properties of nylon, high tenacity rayon and other fibers for steam hoses, bulk loading of chemicals and grains and other uses.

Whatever your rubber-and-fabric problem—see Wellington Sears first.

An illustrated 24-page booklet filled with valuable facts on fabric development and applications of interest to present and potential users of industrial fabrics is yours for the asking. Write for a free copy of "Modern Textiles for Industry" to Wellington Sears Co., Dept. L-2, 65 Worth Street, New York 13.

Superior Fabrics for the Rubber Industry

- Belting duck
- Hose duck
- Enameling duck
- Army duck
- Single and plied-yarn chafers
- Sheeting
- Airplane cloth
- Balloon cloth
- Nylon, high-tenacity rayon, other synthetics and combinations.

Wellington Sears

A SUBSIDIARY OF WEST POINT MANUFACTURING COMPANY

FIRST In Fabrics For Industry

WELLINGTON SEARS COMPANY, 65 WORTH STREET, NEW YORK 13, N. Y.

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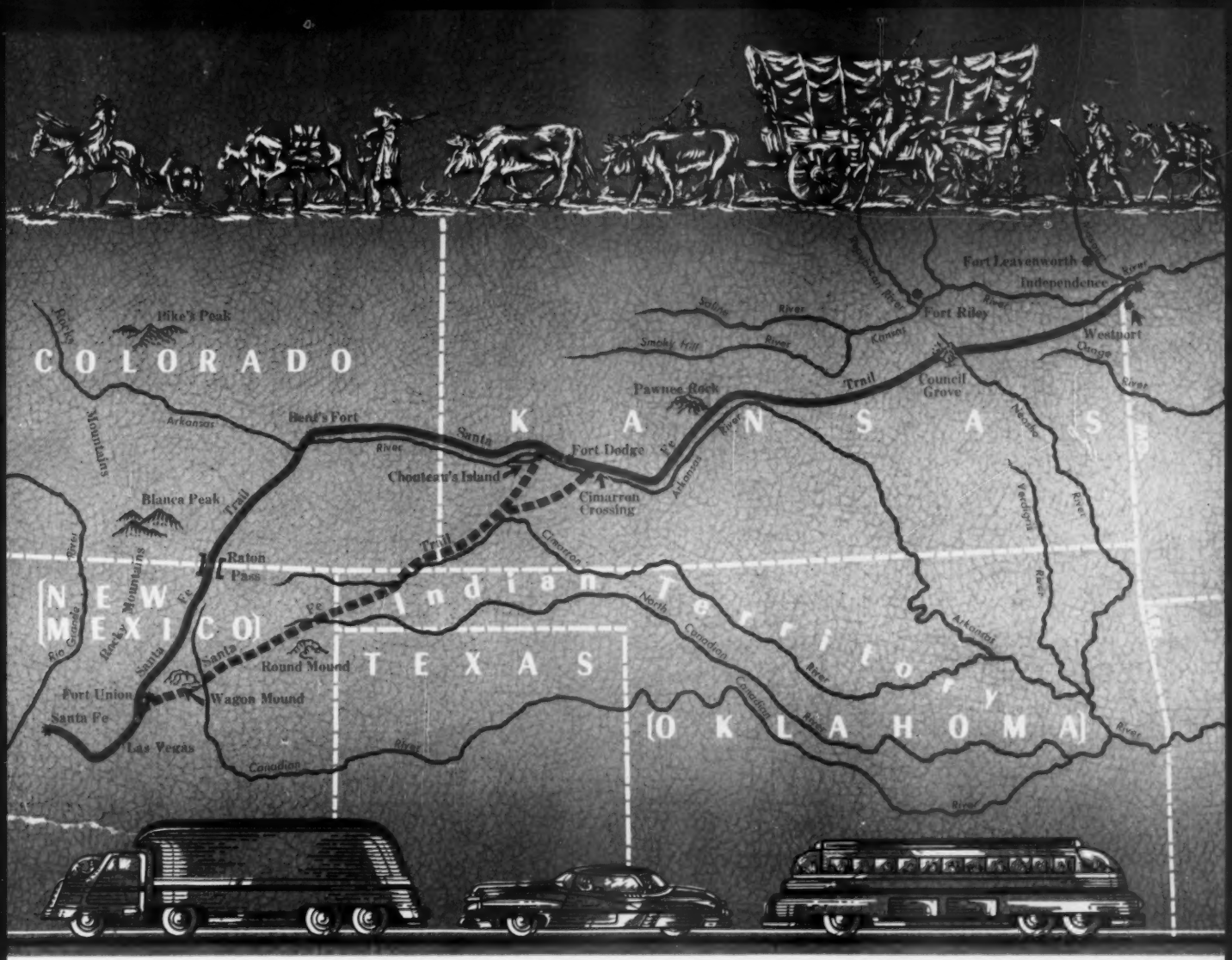


First in a series of Famous Trails, a Reminder of Man's Progress in Transporting Himself and His Products

THE SANTA FE TRAIL

In 1821 Captain William Becknell reached Santa Fe with the first wagons ever to make the journey from the States. The next year $15,000 in goods was transported across the prairies to the ancient town in the southwest. In 1826 Kit Carson ran away to join a caravan for Santa Fe.

Twenty years later the total value of goods making the journey amounted to $450,000. From Independence, Missouri, the Santa Fe Trail stretched out over nearly 800 arduous miles into unknown dangers and difficulties. Days piled upon days as the slow-moving wagons made their journey across the plains, into the shadows of the Rockies and at long last into the town of Santa Fe. The trail the wagons made became in time the thoroughfare for progress.

Today, on the Santa Fe Trail and all other roads where people may be reached, the rubber tire carries the commerce of the day. To the rubber tire we owe much of the tremendous progress man has made in transporting himself and his products.

. . . . . .

CARBON BLACK has played a vital role in this progress of transportation, because it is to carbon black that the rubber tire of today owes its strength, wearability, and mileage.

Not far from Santa Fe, at Eunice, New Mexico, is one of our several plants where we manufacture, from natural gas, this product which contributes so much to better transportation on today's Santa Fe Trail.

UNITED CARBON COMPANY, INC.

United Carbon blacks have the top quality mandatory for tires and other rubber products to blaze a trail in leadership and unexcelled performance. United Carbon blacks are expertly made and scientifically controlled for consistent uniformity and highest standards. Stay ahead with United blacks.

UNITED CARBON COMPANY, INC.

CHARLESTON 27, W. VA.

NEW YORK AKRON CHICAGO BOSTON
CANADA: CANADIAN INDUSTRIES, LTD.

rubber lubrication headaches?

here's the remedy!

DuBOIS Lubes plus DuBOIS Service

DuBois Engineering Service goes right along with DuBois Lubes to help you select and apply the right product in the right way.

Are your headaches caused by problems involving slab dip, internal or external lubrication, bag or mandrel lubrication, tube polish, CV work? If so, there's a DuBois LUBE to cure them. Latex-Lube, a solid, gives maximum economy. Liqui-Lube, a highly concentrated liquid, gives maximum convenience and still keeps costs low. These DuBois LUBES come pigmented or plain. They're suited to all stocks—natural, synthetic or reclaimed. They're safe against hard water, safe against foaming.

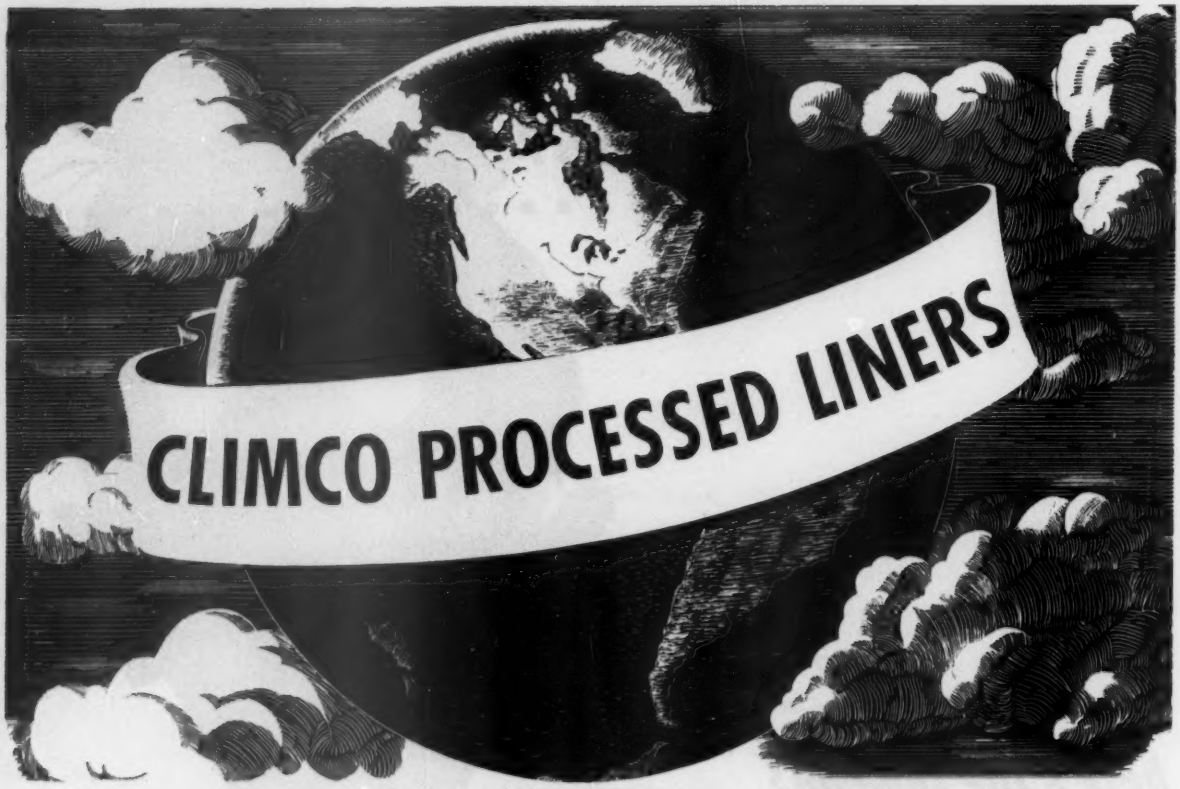
The DuBois Company, always the pioneer in this field, continues to create products that help solve *your* problems. Write today for complete information on any rubber lubricant or maintenance problem. FREE! . . . Handy, pocket-size plastic Slide Rules available for a limited time! Request yours today on your letterhead . . . no obligation.

DuBois warehouses are in every large city—DuBois Engineering Service is instantly available wherever you need it.

The DuBOIS Co., Inc.

CINCINNATI 3, OHIO

SERVING INDUSTRY SINCE 1920



have world-wide acceptance

On every foreign continent, *just as in the U. S. A.*, Climco Liners are speeding production by ending stock adhesions. For Climco Processing insures perfect separation of stock and liner—saving time and reducing expensive stock losses.

Climco Processed Liners also increase the life of your liners and preserve the tackiness of the stock. They also enlarge latitude in compounding, eliminate lint and ravelings and facilitate horizontal storage.

Let us tell you how Climco Processed Liners have proved their worth all over the globe. Better yet, give them a trial.

ILLUSTRATED LINER BOOKLET

Tells all about Climco Liners and Linerette and how to get better service from liners. Write for your copy now.

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West Coast Representative:—MERIT WESTERN CO.
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SERVING THE RUBBER INDUSTRY FOR 30 YEARS

LINERETTE
INTERLEAVING PAPER
Treatment Contains
NO OIL OR WAX
Samples on Request

Are you the Master

of your Paracril® product performance?

Whatever your Paracril product, whether hose or O-rings, diaphragms or printing rolls, *the proper use of plasticizers* will make you the master of your product's properties and performance.

Depending upon the type, combination, and concentration of plasticizers or softeners used, you can increase low temperature flexibility, aid processing, improve tensile strength and tear resistance—bring out exactly those properties *you* want.

Organic ester-type plasticizers, for example, contribute toward low temperature flexibility and high resilience. Coal tar derivatives improve tack, tensile strength, and tear resistance, while petroleum products are particularly useful where high elongation and good tear-resistant compounds are required.

An extensive study has been conducted for your benefit on the use of plasticizers in the Paracrils. To make sure you're getting all the benefits Paracril offers, send for our interesting Technical Bulletin No. 4. Simply fill out the coupon below.

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Rubber Chemicals • Aromatics • Synthetic Rubber • Plastics
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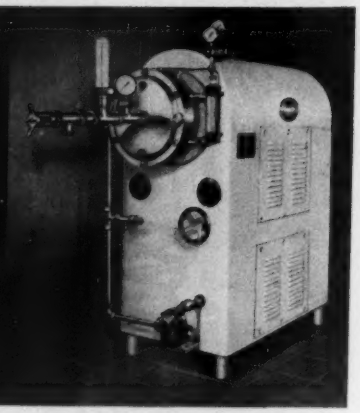
OAKES

CONTINUOUS, AUTOMATIC

FROTHING MACHINE



Partial List of Users

American Foam Rubber Corporation
Burlington, New Jersey

American Latex Products Corporation
Hawthorne, California

Amertex Manufacturing Corporation
Portsmouth, Virginia

Armour & Company, Chicago, Illinois

Armstrong Rubber Company
West Haven, Connecticut

Automotive Rubber & Carpet Industries, Inc.
Yonkers, New York

Crown Rubber Company, Fremont, Ohio

Dunlop Tire & Rubber Corporation
Buffalo, New York

Faultless Rubber Company, Ashland, Ohio

Firestone Rubber & Latex Products Company
Fall River, Massachusetts

Fremont Rubber Company, Fremont, Ohio

Globe Manufacturing Company
Fall River, Massachusetts

Goodyear Tire & Rubber Company, Akron, Ohio

Hewitt-Robins, Incorporated, Buffalo, New York

International Latex Corporation
Dover, Delaware

James Lees & Sons Company
Bridgeport, Pennsylvania

Toyad Corporation, Latrobe, Pennsylvania

United States Rubber Company
New York, New York

Most installations use more than one unit.

If you are considering foam latex—natural or synthetic

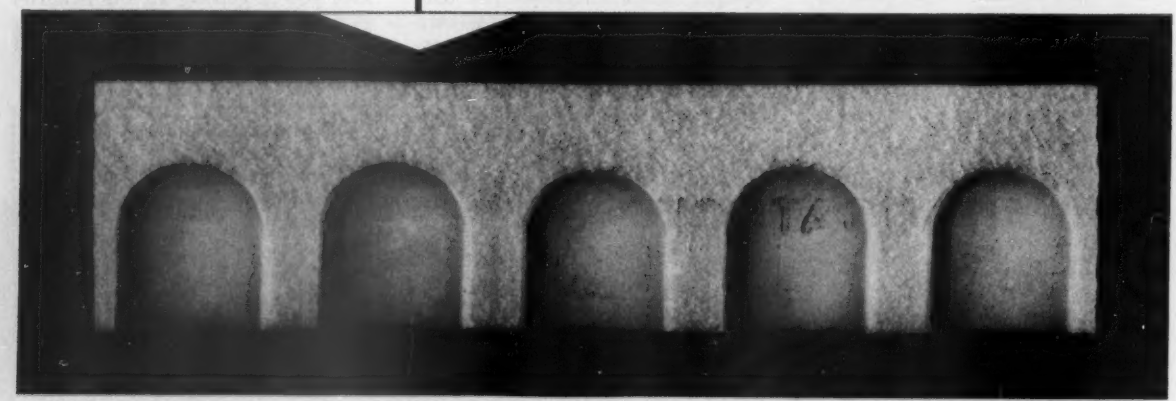
THE CONTINUOUS WAY IS THE PROFITABLE WAY!

Here is what the AMF-Oakes Continuous, Automatic Frothing Machine can do for you:

- Froth 200 to 2,000 pounds of foam latex per hour.
- Produce latex blow-ups of 6 to 18.
- Suitable for slabs, molds, rug backings, pillows, mattresses, furniture and automobile upholstery.
- Ideal for INJECTION MOLDING.

For Complete Information...

Write to Mr. T. R. Stevens,
Continuous Mixing Division
AMERICAN MACHINE & FOUNDRY COMPANY
511 Fifth Avenue, New York 17, N. Y.



Unretouched photograph of foam rubber frothed on the AMF-OAKES Continuous, Automatic Frothing Machine. (Latex blow-up of 14)

Witco-Continental carbon blacks

You can depend on Witco-Continental carbon blacks to give rubber compounds with the same specific properties every time.

Witco-Continental carbon blacks are uniform, dependable, carefully tested . . . delivered to your plant by hopper car, freight car or truck.

Shipments in 50 lb. bags can be palletized for convenient, economical handling where fork lift trucks are available at destination.

FURNACE

Continex SRF
Continex HMF
Continex HAF
Continex FEF

CHANNEL

Continental F, Witco No. 6 } HPC
Continental A, Witco No. 1 } MPC
Continental AA, Witco No. 12 } EPC
Continental R-40 CC

Witco-Continental's modern hopper cars, distinguished by the company name, deliver the best in carbon black right to your door.

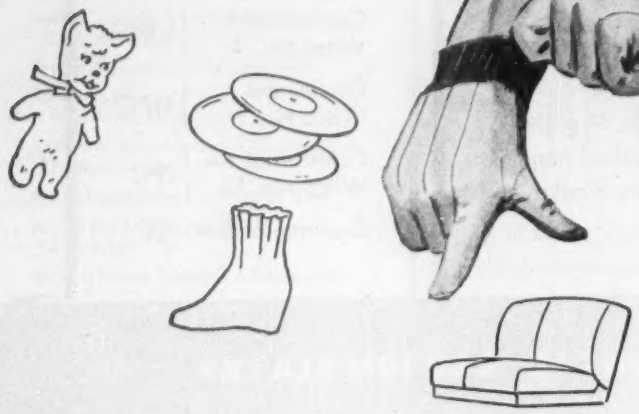
WITCO CHEMICAL COMPANY

CONTINENTAL CARBON COMPANY

295 Madison Avenue, New York 17, N.Y.

Boston • Chicago • Houston • Los Angeles • San Francisco • Akron • Amarillo • London and Manchester, England

They last twice as long... vinyl products stabilized with "Dutch Boy" DYPHOS



Two thousand hours *plus* in the Weatherometer without failure . . . that's the record of "Dutch Boy" Dyphos stabilized vinyl compounds.

In plastisols, as well as organosols and emulsion dispersions, Dyphos gives you opaque vinyl products—unequalled in light- and heat-stability—excellent in color retention and long-lasting flexibility.

Dyphos gives you these advantages in vinyl moldings and extrusions, too.

Recommended also for systems using chloro-paraffins as secondary plasticizers, Dyphos is a general purpose stabilizer. You can rely on Dyphos to give your vinyl compounds the qualities needed for standout performance in service.

Let us show you how "Dutch Boy" Dyphos can simplify your operations...double the life of your vinyl formulations. Also investigate the other "Dutch Boy" chemicals. Just write for factual data and technical assistance.

"Dutch Boy" Stabilizers

PRODUCT	USE
TRIBASE (Tribasic Lead Sulphate)	Electrical and other compounds requiring high heat-stability
TRIBASE E (Basic Lead Silicate Sulphate Complex)	Low volume cost insulation
DS-207 (Dibasic Lead Stearate)	Stabilizer-lubricant for sheeting, film, extrusion and molded compounds
PLUMB-O-SIL A (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored sheeting and upholstery stocks
PLUMB-O-SIL B (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored film, sheeting, belting
PLUMB-O-SIL C (Co-precipitate of Lead Orthosilicate and Silica Gel)	Highly translucent film and sheeting
DYTHAL (Di-basic Lead Phthalate)	General purpose stabilizer for heat and light. Good electrical properties
DYPHOS (Di-basic Lead Phosphite)	Outstanding for heat and light in all opaque stocks, including plastisols and organosols
NORMASAL (Normal Lead Salicylate)	As stabilizer or co-stabilizer in vinyl flooring and other compounds requiring good light-stability
BARINAC (Barium Ricinoleate)	Stabilizer-lubricant for clears

Dutch Boy* CHEMICALS

*Reg. U. S. Pat. Off.

NATIONAL LEAD COMPANY

111 Broadway, New York 6, N. Y.

FOR WIRE INSULATION

These coumarone resins are excellent, economical softeners, pigment-dispersing aids, and extenders in both natural and synthetic rubber wire insulation compounds. In themselves they have excellent electrical properties, impart high tensile with good elongation, good tear resistance, and produce a more uniform compound with a minimum of mixing.

They have been proven the optimum softeners and pigment-dispersing agents, particularly with the more difficult non-carbon black reinforcing fillers.

THE NEVILLE COMPANY
PITTSBURGH 25, PA.
Plants at Neville Island, Pa., and Anaheim, Cal.

R-48

Chemicals for the Rubber Industry

MINNEAPOLIS
Sept. 29, through Oct. 1.

MILWAUKEE
Oct. 7, through Oct. 10.

ST. LOUIS
Sept. 23, through Sept. 26.

BUFFALO
Oct. 29, through Oct. 31.

NEW HAVEN
Nov. 11, through Nov. 13.

BALTIMORE
Nov. 18, through Nov. 20.

NEWARK
Nov. 4, through Nov. 7.

CINCINNATI
Oct. 21, through Oct. 23.

WINSTON-SALEM
Dec. 9, through Dec. 11.

Coming to help you

solve problems in design and production!

"BRINGING the mountain to Mohamet might best describe Dow Corning Corp.'s traveling exhibit . . . Free standing panels . . . separate the exhibit into nine bays, each emphasizing a property of silicones and showing where that property brings a benefit to an actual end product or operating unit . . ."
INDUSTRIAL MARKETING (June 1952)

"NEXT TO THE GREATEST SHOW ON EARTH . . . We could go on . . . reciting the fantastic properties of Silicones, but just as breathtaking as the materials were the display techniques used to demonstrate them . . ."
CIRCUIT RIDER (Vol. 6, No. 2, published by Electrical Construction and Maintenance)

". . . Heat Stability Plus: Visitors . . . see, among other demonstrations, how Silastic (Dow Corning's silicone rubber) remains soft and flexible at temperatures far above the limits of organic rubber . . ."
CHEMICAL WEEK (Jan. 26, 1952)

"IF YOU HAVEN'T already seen it, don't miss it when it comes around . . ."
POWER ENGINEERING (May 1952)

DOW CORNING SILICONES . . . are no longer a mystery or a "future possibility" to the 17,000 executives and engineers, representing more than 4600 plants, who have already seen the Dow Corning Silicone Exposition.*

They learned that silicones are fluids and resins that keep clothes and shoes and brick walls dry in the rain. They're fluids that polish without rubbing.

They're rubber that won't melt on hot aircraft engine cylinders or freeze on switches that operate bomb bay doors at 100° below zero.

They're electrical insulating resins and varnishes that double the power of electric motors, or multiply by 10 the life of electric machines.

They're paints that protect metal at 1000°F. They're foam killers and release agents. They're a whole family of new engineering materials that can help you to improve your product or to cut production costs.

*In Boston • Chicago • Cleveland • Dayton Detroit • Fort Worth • Houston Indianapolis • Los Angeles • New York Philadelphia • Pittsburgh • Seattle Washington, D.C. • or Wichita.

DON'T MISS IT

MAIL THIS COUPON TODAY

Dow Corning Corporation, Dept. CM-22
Midland, Michigan

Kindly include me among your guests at the private showing of the Dow Corning Silicone Exposition in

☐ St. Louis ☐ Buffalo
☐ Minneapolis ☐ Newark
☐ Milwaukee ☐ New Haven
☐ Cincinnati ☐ Baltimore
☐ Winston-Salem

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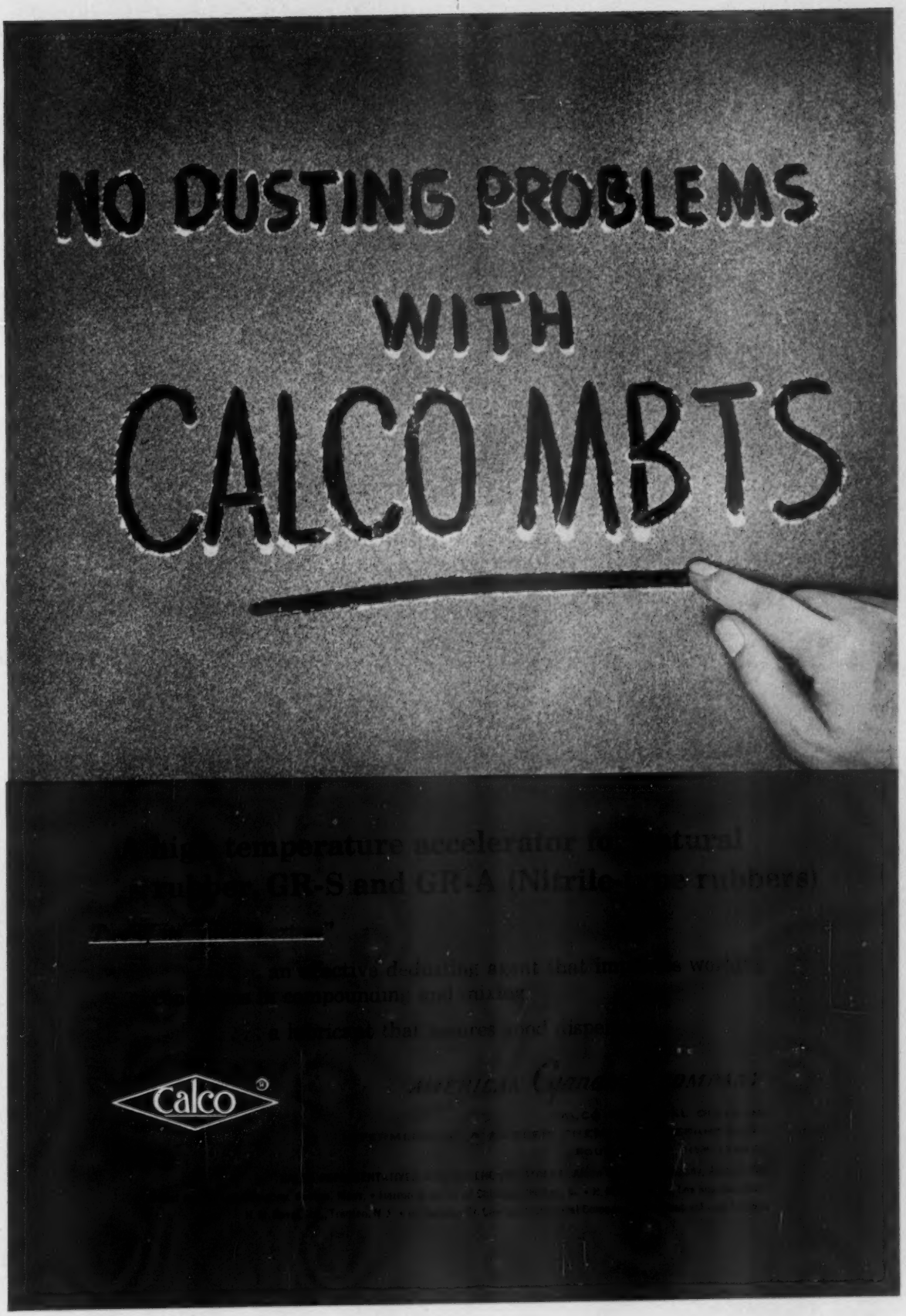
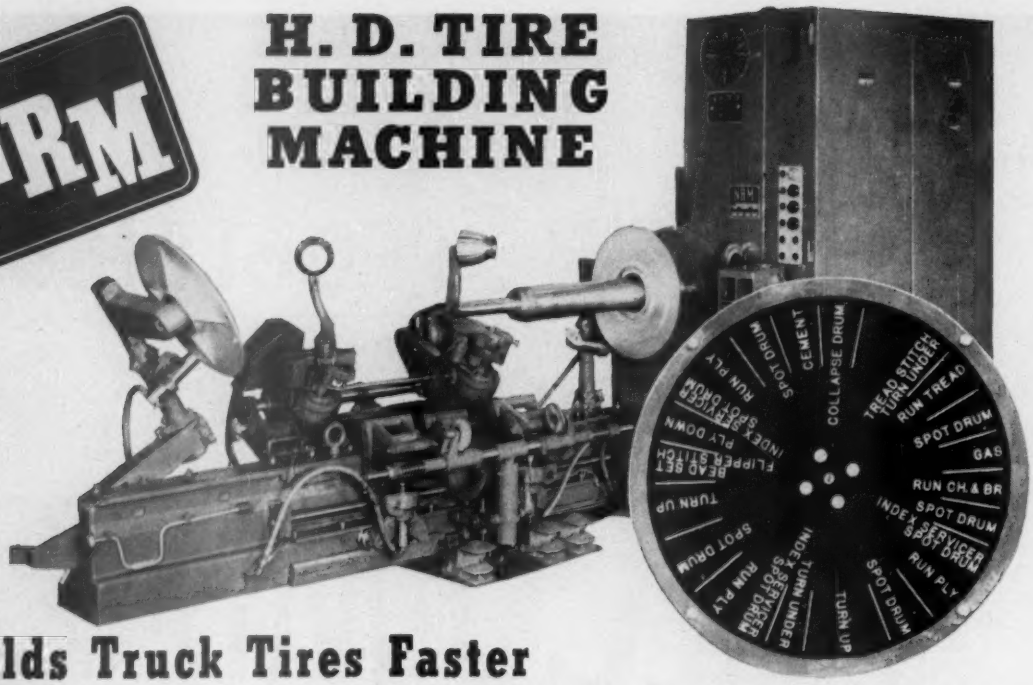
DOW CORNING SILICONES **CORPORATION**
MIDLAND, MICHIGAN

CANADA: Fiberglas Canada Ltd., 1200 Bay St., Toronto, Ontario
ENGLAND: Midland Silicones Ltd., 49 Park Lane, London, W.1


NO DUSTING PROBLEMS
WITH
CALCO MBTS
Calco

H. D. TIRE BUILDING MACHINE



Builds Truck Tires Faster

NRM's new Model 53 H.D. Truck Tire Building Machine. Inset shows dial on electronic timer.

Newest addition to NRM's line of proved and popular tire building equipment is its Model 53 Heavy Duty Truck Tire Building Machine.

A companion machine to the Model 52 for passenger size tires, the Model 53 permits truck tire builders to produce their tires on a semi-automatic basis—at greater speeds—with more uniformity — and, at new saving in production costs.

Improved production with the Model 53 is realized through complete tooling and the replacement of the manual functions of "brake over," "turn up," and "tuck under." This rugged, yet precision-built machine helps the operator build a better tire faster.

Look over these construction details. See how these newest NRM machines compare with your present equipment. Then, write for more information.

	MODEL 52	MODEL 53
BEAD CONSTRUCTION	SINGLE	SINGLE
Drum Size	Primarily for 14" to 16" Bead Size	Primarily for 20" to 24" Bead Size
Bead Diameter Range	12" to 20"	14" to 24"
Shoulder Set	10" to 21"	14½" to 26" (11½" to 14¼" with Special Attachments)
Maximum Drum Diameter	22"	26"
Control	Manual—Semi-Automatic and Automatic	Manual—Semi-Automatic
Timer	Electronic Sequence Timer with Program Drum	Electronic Control for Sequence of Operations
Drum Speeds	190 RPM Bead Stitch 96 RPM Bead and Tread Stitch Low Speed Thru Torque Control for Stock Application	245 RPM Bead Stitch 147 RPM Bead and Tread Stitch 50 RPM Stock Application
Maximum Green Tire O.D.	24"	29"
Tread Stitcher Speed	52" per minute	52" per minute 26" per minute (2 Speed Motor)
Maximum Ply Width	30"	42"
Tire Size	4.50 to 8.00 inc. Cross Sections	5.00 to 10.00 inc. Cross Sections
Weight, Net	3800 lbs.	6100 lbs.
Floor Space	4'6" wide x 9'10" long x 6'0" high.	5'6" wide x 12'10" long x 6'4" high.

2079

NATIONAL RUBBER MACHINERY COMPANY

NRM

General Offices & Engineering Laboratories: Akron 8, Ohio

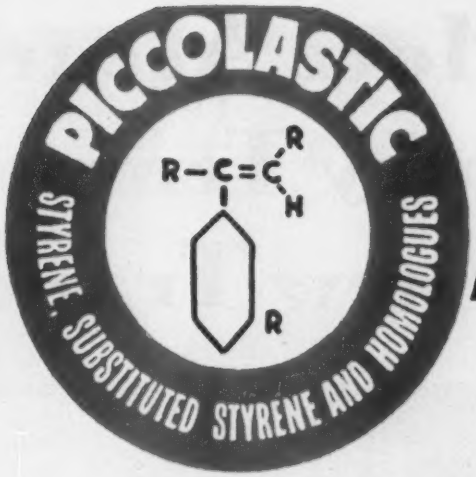
East: 384 Getty Ave., Clifton, N. J.

West: S. M. Kipp, Box 441, Pasadena 18, Cal.

Export: Omni Products Corporation, 460 Fourth Ave., New York 16, N. Y.

Creative Engineering

Synthetic PICCOLASTIC Resins

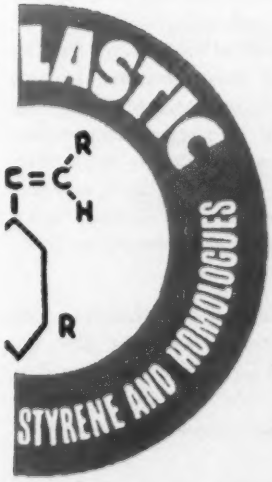


PALE · STABLE

UNSAPONIFIABLE

PERMANENTLY THERMOPLASTIC

ACID AND ALKALI RESISTANT



Piccolastic resins comprise a wide assortment of melting points, molecular weights, solvencies and other properties. They are permanently thermoplastic, and are soluble in aromatic hydrocarbons.

Used for rubber compounding, plasticizing, extending—for floor tile, adhesives, wire and cable insulation, and other products. Write for bulletin giving description and properties of each type. We will be glad to send samples for your examination and test. Please specify the application so that we may send suitable grade.

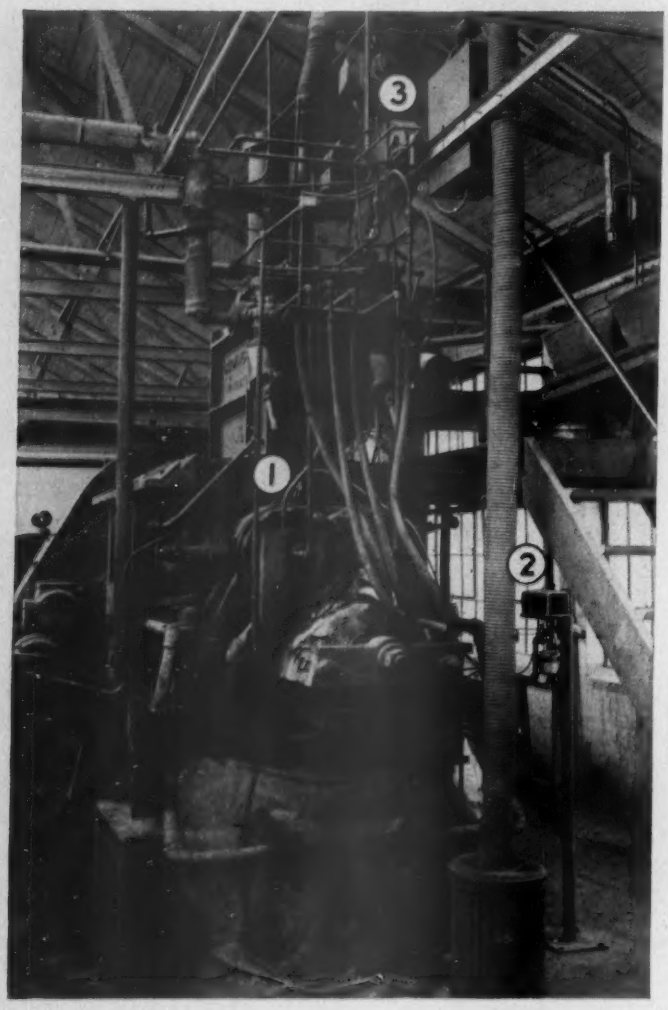
PENNSYLVANIA INDUSTRIAL CHEMICAL CORP.

Clairton, Pennsylvania

Plants at: Clairton, Pa.; West Elizabeth, Pa.; and Chester, Pa.

Distributed by Harwick Standard Chemical Co., Akron 5, Ohio

More Accurate Banbury Temperatures with new Transmitter



How accurately can you measure the temperature of the tough mix inside your Banbury Mixer? Routine laboratory checks prove that the recorded temperatures measured by the TRANSAIRE* Temperature Transmitter are within 2° to 4° of the actual. Moreover, it practically eliminates time lag in the difficult measurement problem, and is so fast and so precise that it gives an accurate record of both the temperature and time of every batch.

The TRANSAIRE force-balance temperature transmitter has created new standards in the measurement of dynamic or changing temperatures. It gives you dynamic compensation for inherent legs both in the measuring system and the rate of heat transfer of the process medium.

The system shown here is installed in the plant of a well known manufacturer of mechanical rubber goods, who are just one of a rapidly growing list of enthusiastic users. It is giving them records of each batch in the Banbury that are most accurate and an improvement over results previously obtained. Because of its rugged temperature sensitive bulb, maintenance is negligible. Ask your Taylor Field Engineer to show you how you can do the same. Taylor Instrument Companies, Rochester 1, N. Y. and Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

*Trade-mark

HERE'S HOW IT WORKS: The tiny temperature-sensitive bulb is installed through the wall of the mixer at point 1, about 1½" into the mix just above the rolls. Impulses from the bulb are converted to output air pressure by the TRANSAIRE Transmitter at point 2, and relayed to a recorder mounted by the catwalk at point 3. Recorder makes a permanent record of true temperature and *actual time* of each batch.

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ACCURACY FIRST
IN HOME AND INDUSTRY

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CALCENE NC is a non-coated, fine-particle, precipitated calcium carbonate. It is similar to Calcene TM in both physical and chemical properties except that it is non-coated.

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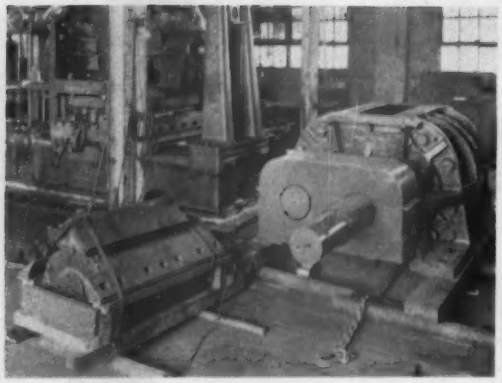

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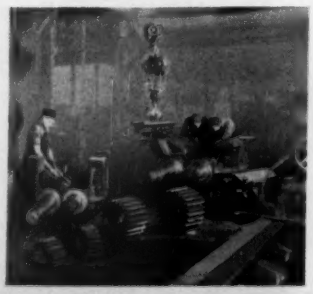

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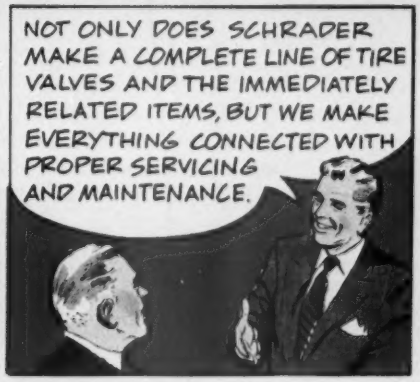
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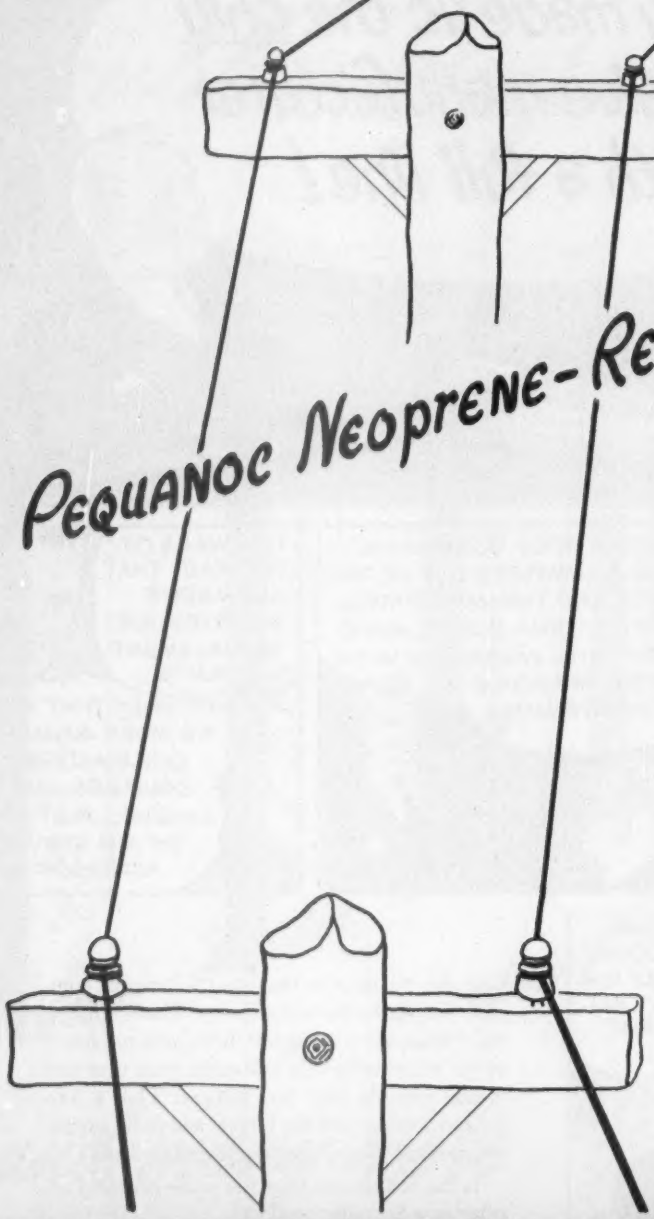
Weather Proof WIRE

Pequanoc Neoprene-Reclaim Insulation



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Extra Light Calcined Magnesia	1.0
SRF Black	24.0
Stearic Acid	1.0
Process Oil	4.4
Petrolatum	1.0
MBTS	1.0
Antioxidant	.5
Saturated Hydrocarbon	3.7
Zinc Oxide	1.6
	100.0
Pound Cost	.2271
Specific Gravity	1.31
Volume Cost	.2975

Physical Test Data
Press Cure—25 Minutes @ 40 lbs.

	Unaged	Aged 96 hrs. Oxygen Bomb (300 psi 70°C)	Aged 7 Days Air Oven 70°C	After Oil* Immersion 18 hrs. @ 121°C
Tensile	1625	1600	1625	1185
Elongation %	790	770	790	490
Shore Hardness 55				

*SAE #20

A working sample furnished on request.

Pequanoc Rubber Co.

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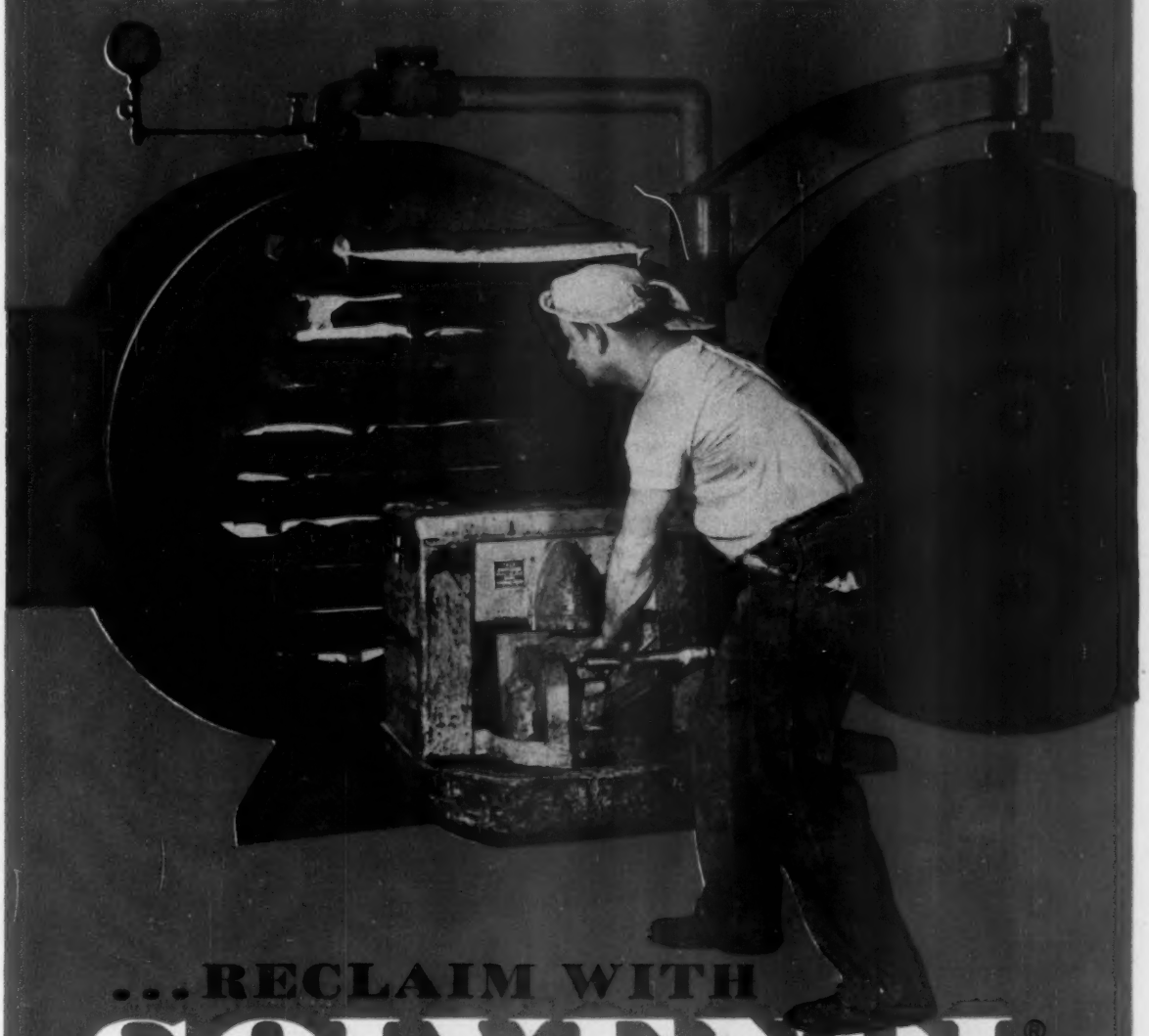

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SUBLAC PX-5
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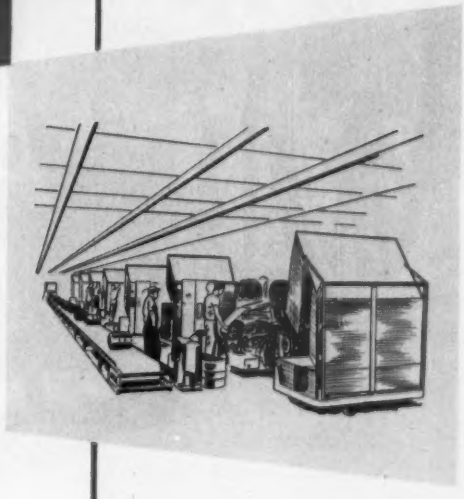
ALUMINUM LEAF TRUCKS



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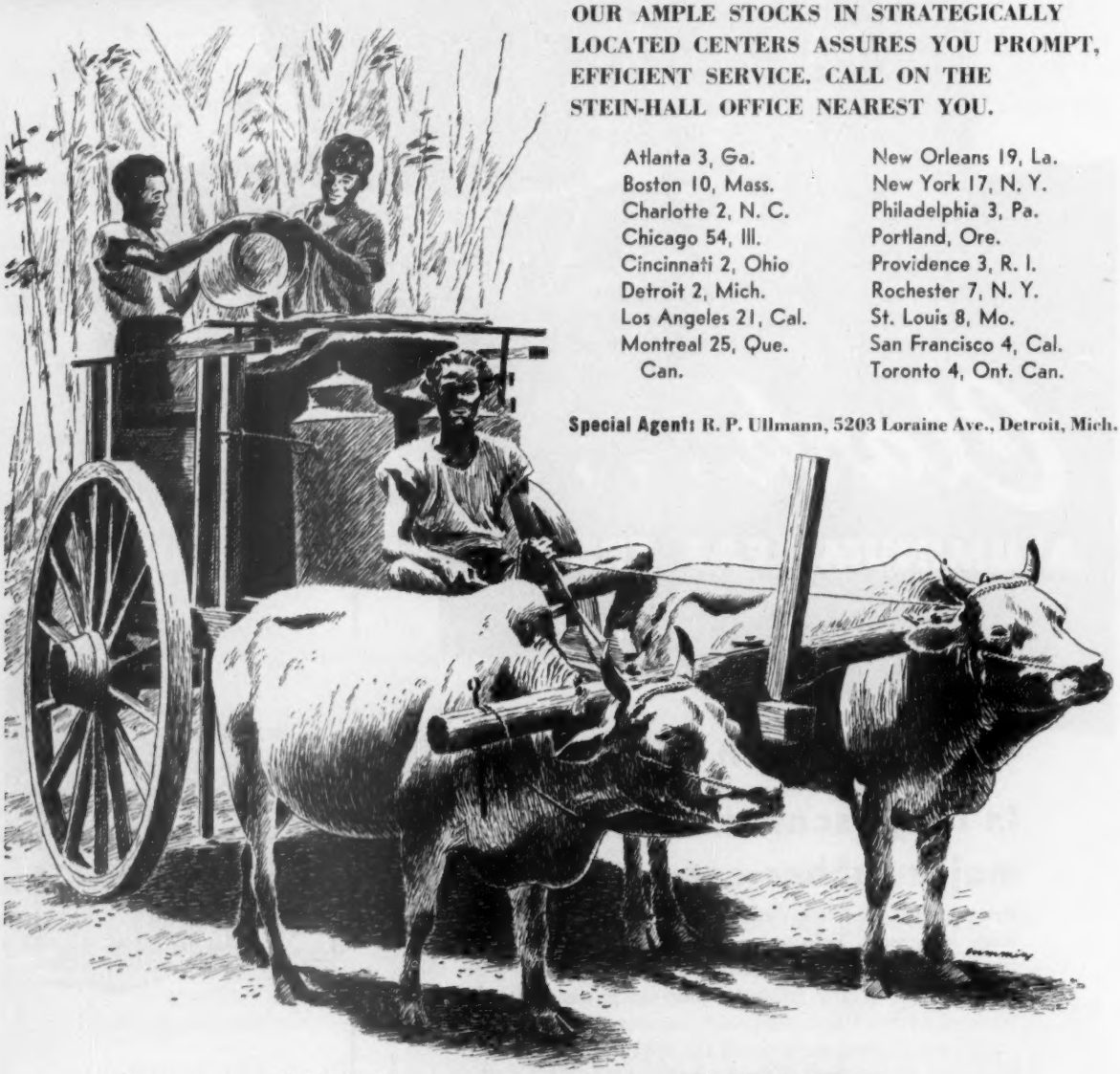

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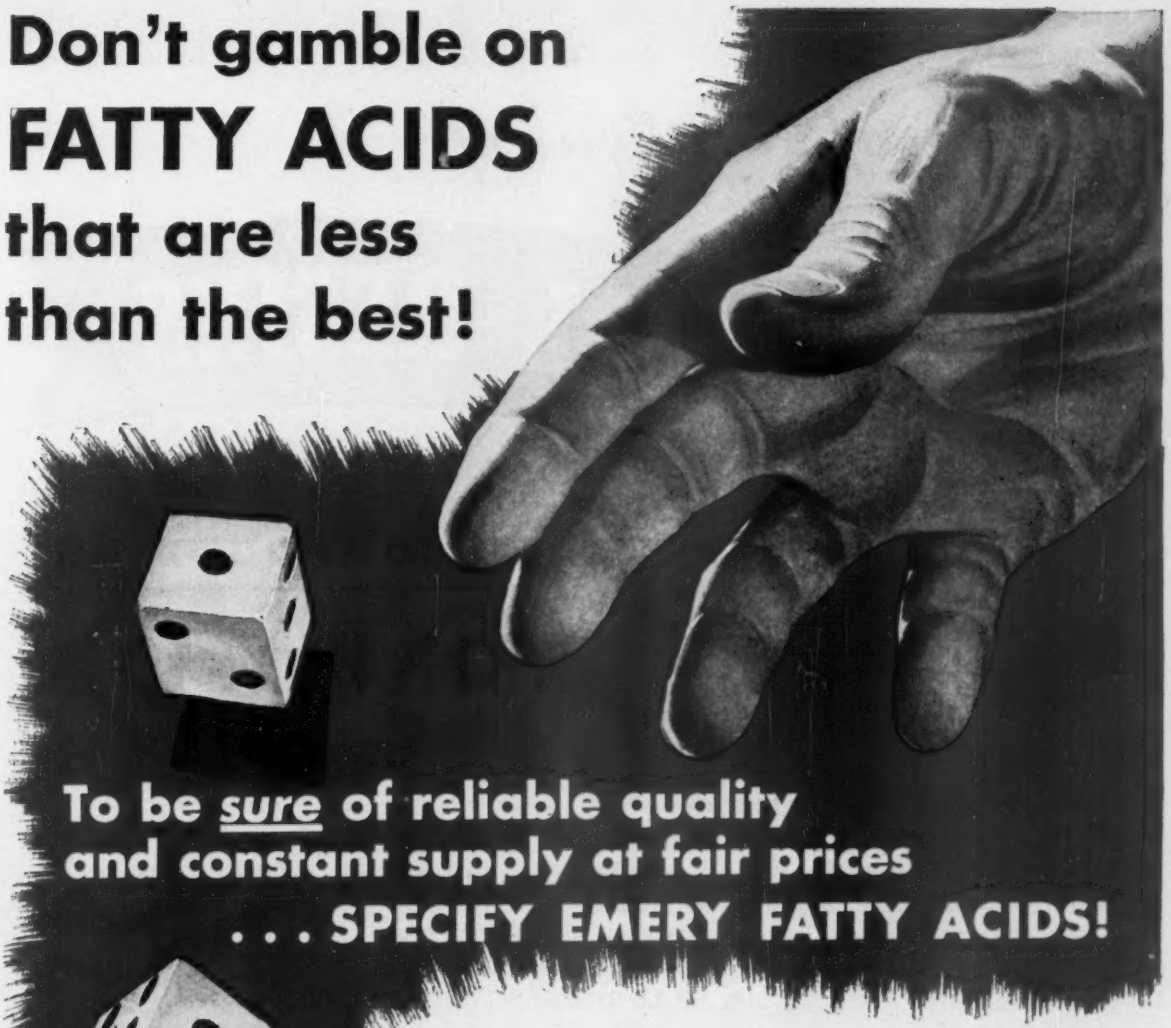

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VOLUME 72
NUMBER 1

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RUBBER AGE

Vol. 72, No. 1 OCTOBER, 1952

The Role of Heat in the Carbon Black Reinforcement of Rubber

Part I—The Carbon Gel Complex in Reinforcement

By C. W. SWEITZER

Columbian Carbon Company, New York, N. Y.

RECOGNITION of the carbon gel complex in 1949 as a fundamental factor in the carbon reinforcement of cold rubber *(10)* has suggested a new approach for following the development of the carbon-rubber bond and for evaluating the role of the complex in the reinforcement of all rubbers. This complex is defined as all the benzene-insoluble polymer associated with the carbon black in the unvulcanized stock.

Recent investigations have established that for an adequate development of this carbon gel complex in cold rubber, the type and loading of carbon, mixing time, resting time after mixing, and temperature of mixing are critical factors. It was demonstrated that in cold rubber this carbon gel complex increases with mixing temperature *(1)* and that this increase is associated with increased modulus and abrasion in the final vulcanizate *(9)*. The lattice-type structure indicated for this complex has been confirmed by the electron microscope *(7)*, and more recently it has been shown that the development of this complex follows an adsorption path *(11)*.

From these various investigations in cold rubber the development of the carbon gel complex is pictured as involving three distinct but not necessarily separated steps, as follows:

STEP 1: The complete wetting of all the carbon black by polymer with the coincidental development of primary carbon-rubber bonds by an adsorption mechanism. In this initial stage the masterbatch is completely soluble in benzene, forming a colloidal black cement.

STEP 2: The knitting of these colloidal primary carbon gel units into an insoluble lattice structure coextensive with the unvulcanized stock, by either additional or stronger carbon-rubber bonds and by secondary polymer cross-links within the lattice structure. This lattice, containing all the carbon, sets the pattern for the performance of the vulcanized stock in terms of those properties such as tensile which are dependent on the primary carbon-rubber bond. It is worthy of note that this carbon-rubber bond is formed without the aid of a sulfur bridging agent.

STEP 3: The stiffening of this lattice by the development of further secondary cross-links within the lattice and in addition possibly by the development of polymer gel containing no carbon but associated with the carbon gel lattice. In this step heat plays the major role. This increase in carbon gel level with heat is associated with increased viscosity in the unvulcanized stock and with enhanced modulus and hardness properties in the vulcanizate.

These investigations were continued to determine the applicability of this pattern of carbon gel development in cold rubber to other polymer-carbon systems. The effects of property variations within the family of rubber carbons were studied. The role of molecular weight and unsaturation in the polymers was evaluated, with particular emphasis on Hevea. In these investigations,

Note: This paper was presented before the Swedish Rubber Institute, Stockholm, Sweden, May 2, 1952.

TABLE I—THE PRIMARY PROPERTIES OF TYPICAL RUBBER CARBONS

The Carbons			Physical			Chemical				
Process	Class	Name	Diameter (μ[b])	Surface[b] (acres/lb)	Structure Index[c]	pH	% Vol.	% Ash	% Ext.	Iodine Surface[d]
Free Flame—Oxidizing										
Channel	EPC	Micronex W-6	29	10.0	110	4.8	5.0	0.05	0.0	10
Roller	Ink[a]	Peerless	25	12.0	100	2.8	15.0	0.04	0.0	19
Lampblack	LB	LB No. 18	100	2.5	200	3.5	1.5	0.02	0.2	2
Furnace—Neutral to Reducing										
Furnace (Gas)	SRF	Furnex	85	3.5	105	10.0	0.5	0.5	0.1	3
Furnace (Gas)	HMF	Statex 93	58	5.0	120	9.5	0.5	0.5	0.2	4
Furnace (Gas)	FF	Statex B	43	7.0	100	9.3	0.5	0.8	0.1	6
Furnace (Gas)	VFF	Statex K	33	9.0	130	9.0	0.5	0.8	0.05	9
Furnace (Oil)	FEF	Statex M	58	5.0	180	9.5	0.3	0.5	0.1	5
Furnace (Oil)	HAF	Statex R	28	11.0	150	8.0	1.0	0.2	0.1	10
Furnace (Oil)	SAF	Statex R-125	22	14.0	145	8.0	1.0	0.2	0.1	13
Thermal—Reducing										
Thermal	FT	P-33	150	2.0	65	8.5	0.3	0.1	1.5	5
Thermal	Acet.[a]	Shawinigan	45	7.0	400	6.5	0.3	0.01	0.1	8

(a) Included to provide extremes in volatile and structure. (b) Based on electron microscope measurements. (c) Determined from oil absorption—normal as 100. (d) Acres per pound, based on nitrogen-iodine adsorption correlation.

temperature as well as the method of processing was varied. From these studies, summarized in this paper, a clearer picture of the carbon-rubber bond, the carbon gel complex, and their role in reinforcement has followed.

Basic Properties of Rubber Carbons

The property variations within the family of rubber carbons are determined at the time of manufacture by the process employed, with operational changes, collection methods and raw materials being important secondary factors. These processes may conveniently be classified into three major groups, each group with its distinctive properties, as shown in Table I.

Free Flame: Common feature is free flame with excess of air giving an oxidizing atmosphere and leading to an oxidized surface on the carbon with resultant high volatile and acid pH. Impingement processes involve many small flames with relatively high flame temperature. Since no spray cooling is used ash and extractable are low. Lampblack processes involve large single flames with somewhat lower flame temperatures. In some instances spray cooling is used; hence, measurable extractable and ash may be present. Structure is normal for impingement blacks but higher for lampblack because of oil fuel used. Particle size tends to coarseness in the lampblack process but to fineness in impingement processes.

Furnace: Common feature is flame confined within a refractory furnace with limited air providing a neutral to reducing atmosphere and leading to an essentially neutral surface with low volatile and neutral pH. Since spray water is required for cooling and temperatures vary, ash and extractable are variable but measurable, carbonate salts in the ash raising pH to the alkaline side. Structure will vary with process and feed stocks. Fineness can be varied within wide limits by size of flame, temperature, time and other operating controls.

Thermal: Common feature is absence of air and hence reducing atmosphere conditions, resulting in very low oxygen volatile and neutral pH. Feed stock used leads to drastic variations in structure. In some instances, the highly reducing atmosphere may lead to high unsaturated carbon surface.

TABLE II—CARBON GEL FOR RUBBER CARBONS IN HEVEA

Carbon	Class	M.B. Load.	Surface (acres/lb.)	Structure Index	Carbon Gel[a] 140°C.	Carbon Gel[a] 225°C.
P-33 ext.	FT	50	2.1	65	0[b]	0
P-33	FT	50	2.1	65	0	0
P-33	FT	75	2.1	65	0	0
P-33	FT	100	2.1	65	0	0
Furnex	SRF	50	3.3	105	11	17
Furnex	SRF	75	3.3	105	17	—
Statex 93	HMF	50	5.2	120	18	19
Statex M	FEF			180	21	24
Shawinigan	Acet.	50	5.5	400	30	33
Statex B	FF	50	7.0	100	24	27
Statex K	VFF	50	9.0	130	30	34
Statex R	HAF	50	11.0	150	34	37
Statex R-125	SAF	50	14.0	140	39	44
Peerless	Ink	50	11.6	100	44	37

(a) % Carbon Gel $= \frac{\text{Weight insoluble rubber}}{\text{total rubber}} \times 100$. (b) P-33 stocks disintegrated on screens preventing carbon gel determinations. Total gel values of 7% for 75 M.B. and 30% for 100 M.B. indicated increased knitting of the carbon gel with increased loading.

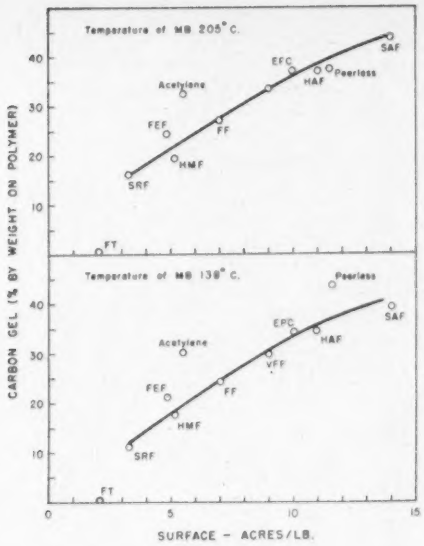

FIG. 1—Effect of carbon surface on carbon gel level in Hevea masterbatches (50 phr).

It is apparent that wide variations in the properties of rubber carbons are developed at the time of manufacture. Of most significance, since it dominates reinforcement, is fineness, expressed as particle diameter or specific surface. Based on electron microscope measurements surface area values range from 2 acres per pound for MT to 14 acres for SAF. Next in importance is structure index, as determined by oil absorption *(12)*, which provides a measure of the reticulate chain structure present in the carbon and an index to the stiffening effect of the carbon in rubber as determined by hardness and modulus. These two physical properties dominate carbon behavior in rubber. Wide differences exist as well in the chemical properties of these carbons, differences that affect cure behavior more than ultimate physical properties. This is particularly true of pH, of volatile, and of iodine adsorption, the latter providing an index to the porosity of the carbon. Ash and extractable matter are not harmful when kept within specific limits.

In summary, the carbon effect in rubber is due primarily to three basic properties: fineness or surface, structure, and surface chemistry or pH, referred to as the Three Building Stones. Fineness is the dominant factor in tensile strength, structure in modulus, and pH in cure behavior. The effects of these three basic properties will vary as the polymer is altered *(2, 3, 12)*.

Effect of Carbon Properties on Carbon Gel

Increasing fineness of carbon leads to higher bound rubber or carbon gel levels, as demonstrated by Fielding in Hevea *(5)* and by Dannenberg and Collyer in GR-S *(4)*. This result is not unexpected in view of the greatly expanded adsorbing surface provided by increased carbon fineness. To this extent then carbon gel would be expected to follow any rubber properties dependent on total carbon surface, such as tensile, rebound and abrasion *(8)*.

Carbon gel determinations were run in Hevea for the range of carbons shown in Table I, not only to check previously reported results but more particularly to determine the effect of physical and chemical properties other than surface on the carbon gel level. Herein might lie some clue to the mechanism of the carbon gel development and some explanation to observed anomalous effects. In these tests the standard procedure previously employed was used *(11)*, involving mixing

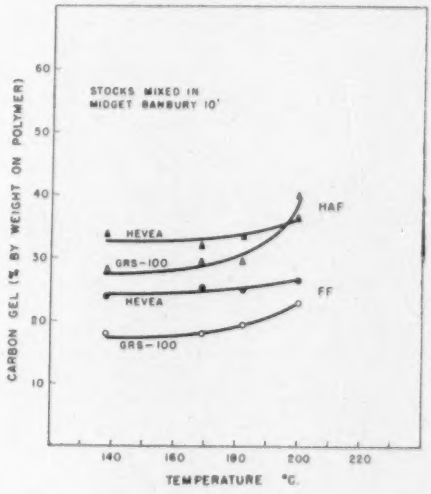

FIG. 2—Effect of temperature on carbon gel in Hevea and GR-S masterbatches (50 phr).

TABLE III—EFFECT OF TEMPERATURE ON CARBON GEL AND SWELLING IN HEVEA AND GR-S MASTERBATCHES

Polymer	M. B. Temp.	FF (Statex B) % Carbon Gel.	HAF (Statex R) % Carbon Gel	EPC (Micronex W-6) % Carbon Gel	EPC (Micronex W-6) Volume Swelling
Hevea	135°C.	24	34	36	30
	170°C.	26	33	36	29
	180°C.	25	33	37	28
	200°C.	27	35	39	28
GR-S 100	135°C.	18	24	20	54
	170°C.	18	29	26	43
	180°C.	20	28	28	36
	200°C.	23	39	35	27

Note: Swelling Volume = Ratio weight of swollen gel/weight of dry gel.

of masterbatch in the midget Banbury for 13 minutes, followed by 24 hours resting before extraction in the modified Baker cell. In order to provide some indication of the effect of temperature, two sets of mixings were prepared, one at 140° C. and the other at 225° C.

The results presented in Table II and graphed in Figure 1 reveal that carbon gel increases with specific surface, with the level measurably higher at the higher mixing temperature. It is interesting to note several exceptions to this correlation. The higher structure carbons show a plus in carbon gel for their surface at both temperatures. The high volatile Peerless shows a plus in carbon gel at the cooler mixing temperature, a plus which becomes slightly minus at the higher mixing temperature. This would indicate that very high oxygen volatile carbons might not follow the standard surface trend in reinforcement, due perhaps to oxidation effects at higher mixing temperatures.

Typical reinforcing carbons were then compared for carbon gel behavior in Hevea and GR-S 100 (LTP) at a range of temperatures. In all cases carbon loadings were 50 parts with mixing time of 10 minutes in the midget Banbury at the specified stock temperature. Samples for carbon gel determinations were taken from the stocks after 24 hours resting and extracted in the modified Baker cell *(11)*.

From the data given in Table III and graphed in Figure 2, carbon gel is shown to increase with fineness (FF to HAF) and with temperature. For both carbons at most temperatures the carbon gel is higher in Hevea than in GR-S 100. The rapid rise in carbon gel for the HAF-GR-S 100 masterbatch at the highest mixing temperature is ascribed to the formation of polymer gel. Polymer gel, as demonstrated in previous studies *(10)*, develops independently of the carbon gel when "scorch" temperatures are reached. This polymer gel contains no carbon and forms apparently from the sol rubber in the masterbatch. Polymer gel will increase the carbon gel level, and will act as carbon gel in giving increased stiffness, but being non-pigmented it is likely to lead to excessive shortness and weakness.

In an effort to check the effect of surface chemistry changes on carbon gel level a series of carbons were treated to provide rather wide changes in chemical properties. These carbons were masterbatched in GR-S 100 and the unvulcanized stocks extracted to determine carbon gel levels by the standard procedure. Results of a variety of tests, typical results for which are given in Table IV, indicated that various deoxidizing or reducing treatments had a minor effect on carbon gel development or level. On the other hand, oxidation treatments tended to reduce carbon gel level.

From these various tests it is concluded that the dominating property of the carbons in carbon gel development is specific surface and that structure and surface oxygen play a minor role unless they are present in an amount substantially in excess of that encountered in the usual rubber carbons.

Effect of Polymer Properties on Carbon Gel

A series of polyisobutylene polymers of increasing molecular weight were mixed with Micronex W-6 carbon by the dry adsorption method *(11)* to determine the effect of molecular weight on carbon gel level. In this dry adsorption method the carbon at the desired loading is added to a solution of the polymer, the mixture is swirled, the suspension is evaporated to a dry carbon rubber film, the film is redissolved to the original concentration, and the adsorbed polymer then determined by standard adsorption procedure. If desired, the dried film can be heated at various temperatures to evaluate the effect of heat on the adsorption level.

The results presented in Figure 3 reveal a marked increase in adsorbed rubber or carbon gel as the molecular weight of the polymer is increased. Molecular weight of the polymer is thus suggested as an important factor in assessing the significance of varying carbon gel levels with changes in polymer type and temperature.

For the investigation of polymer unsaturation effects the polymers selected were Vistanex of a low molecular weight with no unsaturation, polyisobutylene of a high molecular weight with no unsaturation, Butyl rubber containing about 2% isoprene with a low degree of unsaturation, and Hevea with a relatively high level of unsaturation. 100 parts of EPC carbon were mixed into these polymers by the dry adsorption method, and the films were dried for one hour at a range of temperatures.

From the low values shown for Vistanex and polyisobutylene in Figure 4 and the fact that the values for Butyl rubber approach Hevea, it is concluded that unsaturation is required for adequate development of the carbon gel complex but that this level of unsaturation probably need not be as high as given by Hevea and related polymers. Kolthoff *(6)*, working with dilute systems, found a similar relationship between adsorption and unsaturation.

Effect of Temperature on Polymer Gel and Carbon Gel

The insolubilized rubber associated with carbon in the carbon gel complex is not to be confused with polymer gel. In the carbon gel complex the associated insolubilized rubber is developed via an adsorption mechanism from the moment the carbon is first wetted by the polymer during mixing. Raising the tempera-

TABLE IV—EFFECT OF CHEMICAL CHANGES IN CARBONS ON CARBON GEL IN GR-S 100

Carbon[a]	Treatment	Property Change	Carbon Gel in 50 part MB	
			Cool Mix[b]	Hot Mix[b]
HAF	Control	———	27	—
HAF	Deoxidized (870°C./4 days)	Volatile reduced	27	—
EPC	Control	———	21	28
EPC	Deoxidized (980°C./2 hrs.)	Volatile reduced	23	26
HAF	Control	———	27	—
HAF	Oxidized (260°C./16 hrs.)	Volatile increased	20	—
HAF	Control	———	—	45
HAF	Acetone extracted	Extractable removed	—	42
HAF	Reduced (in N_2, 760°C./26 hours)	Oxygen volatile removed	—	41
HAF	Reduced (in H_2, 870°C./35 hours)	Oxygen volatile and sulfur removed	—	41

(a) HAF carbons were Statex R and Philblack O; EPC carbon was Micronex W-6. (b) Cool mixing at 125°C.; hot mixing at 195°C.

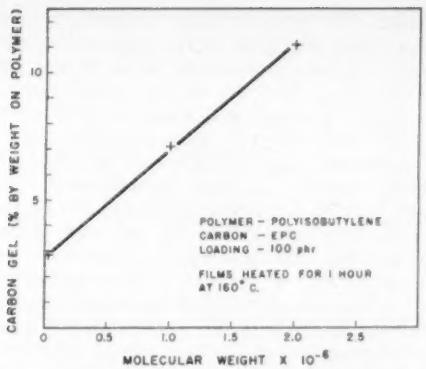
CARBON GEL (% BY WEIGHT ON POLYMER)
MOLECULAR WEIGHT X 10^{-6}
POLYMER – POLYISOBUTYLENE
CARBON – EPC
LOADING – 100 phr
FILMS HEATED FOR 1 HOUR AT 160° C.

FIG. 3—Effect of polymer molecular weight on carbon gel—dry adsorption method.

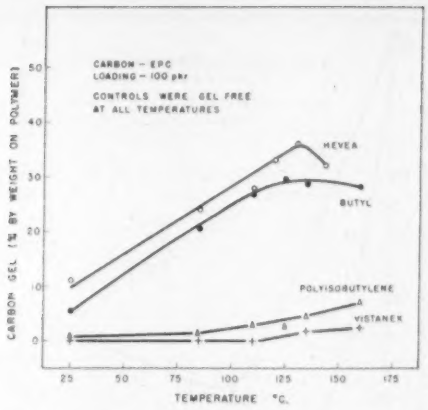

FIG. 4—Effect of polymer unsaturation on carbon gel—dry adsorption method.

ture during or after mixing of the polymer and carbon leads to an increase in the carbon gel level, an increase that varies with the polymer, the carbon and the temperature range. This increase in carbon gel level with temperature occurs at a temperature level below that required to form polymer gel in the raw polymer. Hence, carbon gel development is a phenomenon independent of polymer gel, although the mechanism involved in its increment via heat is undoubtedly similar to the oxidative gelation reactions that lead to polymer gel.

When the temperature applied to polymer-carbon systems is raised beyond the level required to form polymer gel there is likely to be a pronounced shift in the trend of carbon gel development, due either to the disturbing effect of the polymer gel reactions or to the coincidental development of polymer gel. To check this effect of higher temperature treatment on the carbon gel level with different polymers, the development of polymer gel (in the raw polymer) and of carbon gel (in 100 part EPC masterbatches of the same polymers) was followed over a range of temperatures extending to the level previously found sufficient to produce polymer gel in GR-S 100. In these studies the dry adsorption method was employed.

Significant differences between the polymers are evident from the results presented in Figure 5. The completely saturated polyisobutylene develops no polymer gel at any temperature and the carbon gel level is low. The slightly unsaturated Butyl rubber likewise develops no polymer gel at the temperatures used, but the carbon gel level and rate of increase is significantly higher. Hevea shows a decided tendency to rapid polymer gel development at temperatures above 160° C., whereas the carbon gel level appears to reach a maximum at about 130° C. The decrease beyond 130° C. may be due to excessive scission of the polymer in this temperature range.

Of most interest are the results with GR-S 100. Polymer gel in the raw polymer develops very rapidly at temperatures above 150° C., reaching 80% of the total at 160° C. Carbon gel develops sharply in the same temperature range but not nearly as much as the polymer gel, with the carbon gel curve actually crossing the polymer gel curve. This effect is due to the repressing action of the carbon on the oxidative gelation reactions and is ascribed tentatively to the removal by selective adsorption of the oxidative intermediates involved in the gelation reaction. It has been designated as gel repression *(11)*.

If this gel repression effect occurs with GR-S polymers at the temperatures employed then it seems likely that the same effect should hold with Hevea where higher temperatures or longer heating times are required to reach these high polymer gel levels.

Polymer Gel Repression and Carbon Gel

In a recent paper *(11)* the maximum gel repression for EPC black in cold rubber was reported to occur at the 50 part loading, using the dry adsorption technique. In this method, as then employed, the polymer solution and carbon were simply swirled in a flask to provide an intimate but not dispersed blend of carbon and polymer. More recently this method has been modified to provide a colloidal dispersion of carbon in the polymer solution by increasing the severity and time of agitation. Using this modified dry adsorption method it has been found (Figure 6) that the maximum gel repression occurs at much lower carbon loadings, due to the increased carbon surface now available for adsorption.

The maximum gel repression in cold rubber is shown to occur with a 10 to 15 part loading of EPC instead

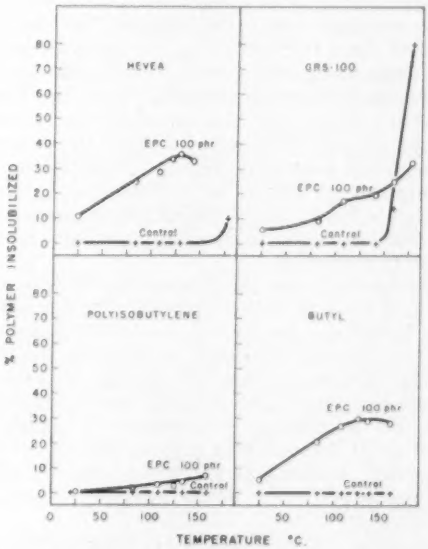

FIG. 5—Effect of temperature on polymer and carbon gel—dry adsorption method.

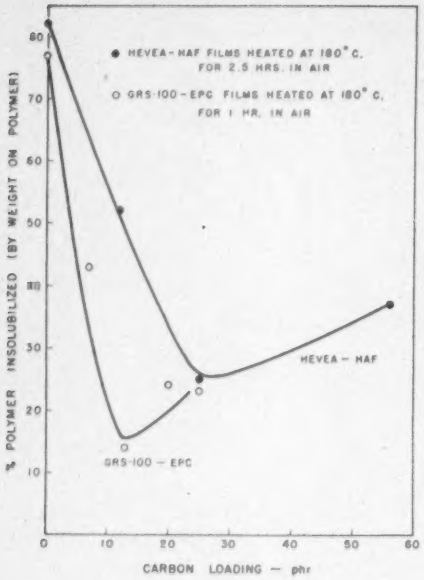
● HEVEA-HAF FILMS HEATED AT 180° C. FOR 2.5 HRS. IN AIR
○ GRS-100-EPC FILMS HEATED AT 180° C. FOR 1 HR. IN AIR
HEVEA – HAF
GRS-100 – EPC
% POLYMER INSOLUBILIZED (BY WEIGHT ON POLYMER)
CARBON LOADING – phr

FIG. 6—Polymer gel repression by carbon black—modified dry adsorption method.

of the 50 part loading previously reported. In Hevea, maximum gel repression occurs at about the 25 part loading with HAF carbon. This difference between the polymers in the carbon loading required for maximum gel repression is probably associated with differences between the oxidizability of Hevea rubber and GR-S 100.

These gel repression results were obtained by the modified dry adsorption method, which involved heating of a static system. To check whether similar results were obtainable in a dynamic system, a series of masterbatches, covering a range of EPC carbon loadings in GR-S 100, were prepared in the midget Banbury, at a temperature and time that had been shown to develop 45% polymer gel in the raw polymer. As shown by the graphed data in Figure 7 a similar gel repression effect is obtained by mill mixing. From this similarity in polymer gel repression results shown by Banbury masterbatch mixing and the modified dry adsorption method we conclude that in the modified dry adsorption method a simple laboratory means is made available for duplicating the gel effects of mill mixing. It is also evident that in kind if not in magnitude the same adsorption phenomena occur in Banbury mixings as in the dry adsorption method.

Gel repression is an effect occurring at temperature levels where polymer gel is formed in the raw polymer, whereas carbon gel develops at the lowest mixing temperatures as soon as the carbon is wetted by the carbon. Increasing the temperature of mixing increases this carbon gel level, the increase rising sharply as the temperature of polymer gel formation is approached. Hence, it seems reasonable to suppose that the selectivity in adsorption involved in the gel repression effect is also an important factor in the increase of carbon gel level.

In the initial stage of carbon gel development at low mixing temperatures (Step 1) any selectivity in adsorption of polymer by the carbon black is limited to molecular weight differences. With higher mixing temperatures the carbon gel level is increased, probably involving an increased and more selective adsorption of intermediate oxidative products of the aggregative and disaggregative reactions initiated by these higher temperatures. Continuing into the higher temperature zone, where normally polymer gel would be formed in the raw polymer, this selective adsorption by the carbon black is accelerated and the polymer gel reaction correspondingly repressed. Thus, at these high temperatures there are two competing reactions, the aggregative or oxidative reactions within the polymer striving to build polymer gel, and the carbon gel reaction involving selective adsorption of the intermediate products from these aggregative reactions tending to build carbon gel.

The factors involved in this maximum gel repression effect include the rate of the aggregative reaction in the polymer, the total carbon surface available for adsorption of the oxidative intermediates from the aggregative reaction, and the rate of carbon gel development. Maximum gel repression apparently occurs when the carbon surface available for adsorption just falls short of that required for initial development of the carbon gel complex; at this point (Step 1) there is the highest ratio of selective to non-selective adsorption. Beyond this critical loading the carbon gel complex forms rapidly and the level of insolubilized rubber (either as carbon gel or polymer gel) is correspondingly raised.

Stiffening Effect of Carbon Gel in Unvulcanized Stocks

If the carbon gel level in unsaturated polymers increases with temperature and the effect is to increase stiffness in the final vulcanizates then this effect should be measurable in the unvulcanized masterbatch stocks, since as pointed out previously the carbon-rubber bonds developed in the carbon gel complex undoubtedly persist in the vulcanizate.

To check this effect, test specimens suitable for strain testing were prepared from the colloidal carbon rubber systems employed in the modified dry adsorption technique. A preferred method involved successively dipping a glass rod into the colloidal system to develop a film of adequate thickness and then rolling off the film into the form of small symmetrical rings of about ⅛-inch diameter.

Results of strain tests on such Hevea test rings are set forth in Table V, in which are shown the percent

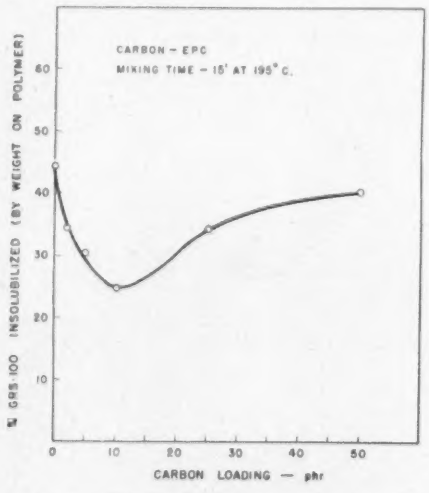

FIG. 7—GR-S 100 gel repression by carbon black—midget Banbury.

TABLE V—EFFECT OF HEATING ON THE STRAIN TIME PROPERTIES OF HEVEA AND HEVEA-CARBON BLACK TEST RINGS

Stress (gms.)	% Elongation (taken at 2 minutes) Hevea		Hevea—Carbon Black				
	Control	1 hr @ 120°C. in Nitrogen	Control	1.5 hr @ 95°C. in Nitrogen	1.5 hr @ 120°C. in Nitrogen	1.5 hr @ 135-140°C. in Nitrogen	¼ hr @ 125°C. in Air
200	breaks before 2 min.		250	175	150	75	375
400			850	675	575	275	1125
600			1200	1000	825	575	1700
800			1400	1200	1050	800	——

Carbon Loading—61 phr EPC (Micronex W-6).
Stress needed for a 800% elongation (from graph of these data):

Sample	Stress (grams)
Control	375
1½ hr. at 95°C. N_2	475
1½ hr. at 120°C. N_2	525
1½ hr. at 140°C. N_2	800
¼ hr. at 125°C. Air	325

elongations for a definite time interval under varying stress conditions. From these test data, stress-strain values were plotted to give the stress-strain curves presented in Figure 8.

The gum Hevea rings were very weak, gave no values under the test conditions employed, and are not shown in this figure. In the presence of carbon black, however, a pronounced stiffening resulted as shown for the control films dried at room temperature. This stiffening effect was enhanced when the films were dried at higher temperatures in an atmosphere of nitrogen, under which conditions gelation reactions involving either polymer gel or carbon gel would dominate. The stiffening effect was depressed when the films were dried at higher temperatures in air, under which conditions the scission reaction predominates.

From these data the stress data for varying temperatures can be interpolated and graphed as shown in Figure 9. Stress is shown to increase with temperature, sharply in the temperature range beyond 100° C. The results reveal a gradual strengthening of the carbon to rubber bond in the carbon gel complex by heat, possibly through stronger attachments on the carbon surface but more probably by cross-linking between the individual carbon gel units that make up the lattice. These preliminary results suggest a new and important approach for study of the strengthening effects of carbon black in unvulcanized polymers.

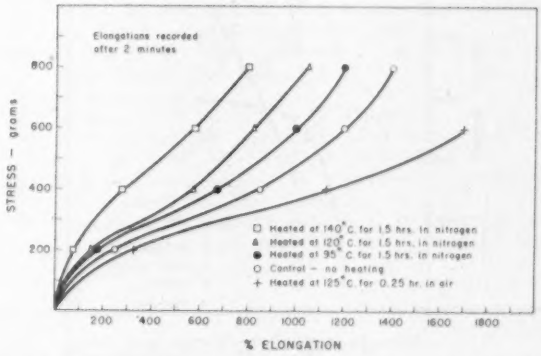
Elongations recorded after 2 minutes
STRESS – grams
% ELONGATION
Heated at 140°C. for 1.5 hrs. in nitrogen
Heated at 120°C. for 1.5 hrs. in nitrogen
Heated at 95°C. for 1.5 hrs. in nitrogen
Control – no heating
Heated at 125°C. for 0.25 hr. in air

FIG. 8—Effect of heating on the stress-strain of Hevea-EPC unvulcanized test rings.

Stiffening Effect of Carbon Gel in Vulcanized Hevea Stocks

It has been pointed out that carbon gel effects, such as increase with temperature and gel repression developed by the dry adsorption method, can be duplicated in kind by mill mixing. It might be expected then that the observed increase in stiffening with temperature, as developed in unvulcanized masterbatches by the dry adsorption method, should have its counterpart in vulcanizates prepared from masterbatches processed under similar temperature conditions. On the basis of the results described in this paper, high temperature mixing on the mill should give a lower level of carbon gel formation and consequently less stiffening effect than a processing method involving a severe static heat step. In the latter case the carbon gel lattice is likely to be cross-linked to a greater degree and in addition polymer gel is more likely to be developed.

To check this possible correlation, tests were run on the series of "scorched" stocks prepared in connection with Part II of this paper. In all cases carbon gel levels were determined for the final 50 part fully compounded stocks. For the stiffening effect the L-300 modulus values were taken at the fixed cure of 40 mins. at 142° C. These carbon gel and modulus values are set forth in Table VI.

It will be noted that with all scorch treatments the carbon gel level is increased significantly, with the

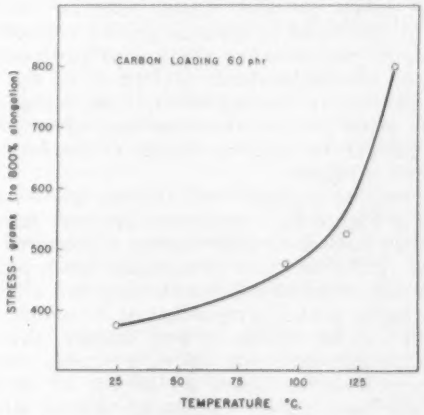

FIG. 9—Effect of temperature on the stiffening of unvulcanized Hevea-EPC test rings.

TABLE VI—CARBON GEL IN UNVULCANIZED VERSUS STIFFENING IN VULCANIZED HEVEA COMPOUNDS

Mixing Process	Temperature	Carbon Gel FF[d]	Carbon Gel HAF[d]	Carbon Gel EPC[d]	Modulus (L-300) FF	Modulus (L-300) HAF	Modulus (L-300) EPC
2 roll mill	90°C.	14	22	22	1190	1960	1535
Gerke[a]	170°C.	22	32	33	1745	2420	2025
Bradley[b]	150°C.	39	40	46	1780	2530	2320
Columbian[c]	195°C.	21	29	34	1710	2405	1965

(a) Gerke method as modified for these tests involved mixing MB of 50 parts carbon in Banbury at temperature shown for 30 mins. Final mixing on open mill. (b) Bradley method involved static heating of a 67 part MB in oven under nitrogen at temperature shown for 2 hours, with final dilution and mixing after rest. (c) Columbian method involved Banbury mixing of 75 to 80 part MB (depending on carbon) at temperature shown, followed by cooling and finishing in cool Banbury. Total time 7 mins. (d) Carbons were Statex B (FF), Statex R (HAF), and Micronex W-6 (EPC).

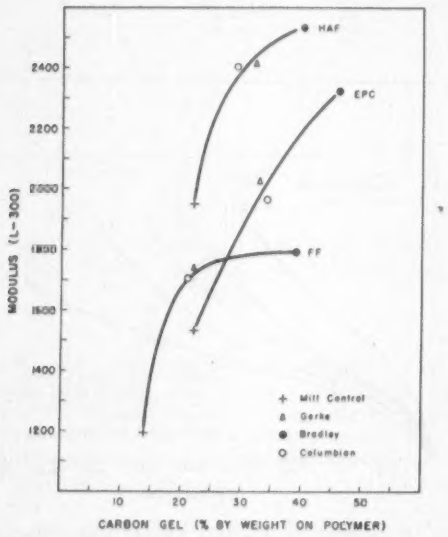

FIG. 10—Effect of carbon gel on modulus in Hevea.

greater increase for the static method. The carbon gel level as might be expected is greatest for the finer carbons. Levels for the Gerke and Columbian methods fall in line with the midget Banbury results shown in Figure 2, but the Bradley static carbon gel values are at a higher level and fall more in line with the values shown in Figure 4 for the dry adsorption method.

These carbon gel and related stiffening effects in Hevea, as developed by various heating methods, play a significant role in other physical properties for the vulcanizate as will be shown in Part II of this paper. But of interest to this discussion is the fact that heat plays the major role in producing these effects and that carbon gel with its simple carbon to rubber bond is the mechanism involved.

The modulus increases with carbon gel level were graphed in Figure 10 to bring out significant differences between the carbons in their reaction to the three scorch methods. EPC carbon, a fine channel black with normal structure, shows a continuous sharp rise in modulus with the higher gel levels regardless of the scorch method employed. HAF carbon, a fine furnace black with somewhat higher structure, shows a similar sharp rise in modulus with the higher gel levels. FF carbon, a moderately fine furnace carbon of normal structure, shows the greatest benefit percentage-wise in modulus increase, but no additional benefit from the higher carbon gel level given by the Bradley method. These differences are ascribed to the variation in gel repression effect between the carbons and to the changes in the carbon gel system induced by the varying scorch methods involved.

Photomicrographic Confirmation of Carbon Gel in Hevea

Ladd and Ladd *(7)* confirmed by the electron microscope the lattice-type structure of the carbon gel complex in cold rubber, the series of photomicrographs indicating that this lattice consisted of all the carbon black enmeshed in a web of insoluble rubber. At excessive "scorch" temperatures polymer gel formed in association with the carbon gel was identified as rod-shaped particles of insoluble rubber containing no carbon. Clear portions in the field were recognized as areas from which the soluble or sol rubber had been removed by extraction.

Using a similar technique, a photomicrograph of Hevea carbon gel was obtained, with the result shown in Figure 11. The carbon gel units, as well as the areas from which the sol rubber was removed, are recognized. No unpigmented polymer gel is in evidence. The carbon gel units in Hevea are not quite as compacted or as large as the units in cold rubber but there is more evidence of the insoluble rubber combined or attached to the carbon particles. This carbon gel rubber is recognized as a grayish field immediately surrounding and bridging the carbon particles.

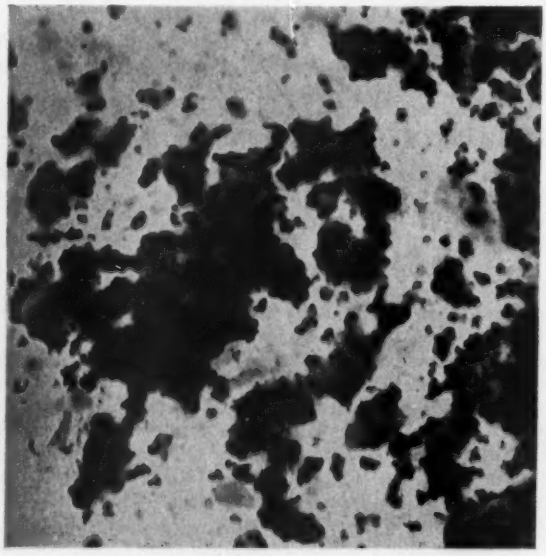

FIG. 11—Hevea carbon gel (X50,000).

Conclusions

In the family of rubber carbons, fineness or total surface is the dominant factor in carbon gel development. Structure, pH and other properties of the carbons play a various but relatively minor role.

Carbon gel increases with molecular weight of polymer and with polymer unsaturation. The effect of unsaturation is so pronounced as to suggest that polymer unsaturation is essential for the full development of the carbon gel complex. The degree of unsaturation required for full development of this complex need not be much higher than that provided by Butyl.

The carbon gel level increases in all polymers with heat, an effect ascribed to more carbon-rubber bonding. The effect of carbon black in repressing the gelation reaction in the raw polymer suggests that one mechanism in the development of carbon gel (with heat) may be the selective adsorption by the carbon of oxidative intermediates.

The increased carbon gel level is associated with higher stiffness in the vulcanizate as measured by modulus. This stiffening effect can be evaluated in unvulcanized Hevea stocks by stress-strain tests on test rings.

Since in these stiffening effects no bridging agent is involved, with the possible exception of oxygen, it is concluded that carbon gel is the significant factor in the carbon reinforcement of Hevea as well as other unsaturated polymers.

(EDITOR'S NOTE: Part II of this paper, entitled "Carbon Black Dispersion and Heat in Factory Processing for Optimum Reinforcement," by H. A. Braendle, will be published in our next issue.)

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The Problem of Static Electricity

STATIC electricity continues to be the most frequent cause of fires in company plants. While it is not possible in this space to discuss all the factors affecting static electricity, there are several points which are important and if applied to those locations where static fires have occurred or are likely to occur, a reduction in fires resulting from this cause should be possible.

At the present time, there is no known way to prevent the generation of static electricity. Each material has its own electrical properties and when in contact with a dissimilar material, electrons migrate from one material to another. Upon separation of the two materials, the material having an excess of electrons is negatively charged while the other having lost electrons is positively charged. In this manner, potentials as high as 100,000 volts are produced. Factors affecting the amount of voltage generated are electrical properties of the two materials (dielectric constant), pressure by which the two materials are pressed together, temperature, relative humidity, and the speed of separation.

Even though one of the materials, such as a metal idler roll in a conductor, is grounded, the non-conductive substance may still maintain one-half the original voltage potential generated. Although complete grounding of all conductive portions of hazardous equipment is necessary and recommended, grounding itself will not completely eliminate the hazard since the charges on the non-conductive material may not migrate to the grounded portion of the equipment. Humidification, which is also commonly used to mitigate static electricity, is only one factor which affects its generation and it may not alone prevent the build-up of dangerous potentials.

In view of the foregoing, static eliminators which are specially designed to drain excess electrons to ground or provide electrons from ground to the charged material, must also be used. Various devices are on the market to accomplish this purpose. These operate on the principle of ionization of the air near the charged material reducing the insulating value of the air and allowing the charges to dissipate. The so-called static brushes are the simplest devices of this nature. Ionization is also created by using artificially generated potentials and by radioactive materials. Static brushes, if properly designed and installed, are inexpensive, produce satisfactory results, and require minimum maintenance.

Other important factors to be considered are the operators of equipment. In moving about they may develop high voltage potentials on their bodies which may discharge upon approaching grounded objects. It is therefore necessary to provide grounded floor plates in the vicinity of machinery where a static spark might cause a fire. Cotton wearing apparel and shoes having conductive soles should be worn. When workers normally leave the grounded floor area during the course of their work, it is advisable to provide grounded hand bars which they can grip upon returning to the grounded area.

It is felt that application of the above principles to various static hazards will go a long way towards the reduction of fires caused by static electricity. Needless to say, good maintenance of grounds, humidifying equipment and static eliminators is an important factor in preventing static fires.

U. S. Rubber Safety Digest

Present and Future Requirements of Rubberlike Materials for a Global Air Force

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IN this age of necessary emphasis on military preparedness, there is no doubt that aircraft and guided missiles will be weapons of great strategic importance. While the tremendous problems involved in the design and fabrication of these new weapons are recognized quite early, strangely enough the problem of obtaining suitable materials for fabrication are frequently overlooked or ignored until shortly before actual construction has begun. Then it is not at all unusual for the materials engineer to be approached with a demand for a material which will do such and such or so and so. The answer that "there is no available material which will do such and such or so and so" is not always considered acceptable.

The demand for greater speed and higher load carrying ability from aircraft results in a requirement for power plants which are capable of delivering more thrust, or horsepower per pound, and for aircraft structures which are lighter in weight. In general, greater efficiency and more power can be obtained from a power plant by raising the operating temperature, and weight saving can be accomplished by the development of lighter metals which are structurally as strong or stronger than those currently in use. It is therefore obvious that the development of metals, alloys, and ceramics capable of withstanding higher operating temperatures or exhibiting greater structural strength is of major importance.

Materials Problems of Major Importance

However, assuming for the moment that superior materials for such construction purposes are available, what other materials problems of major importance may be encountered?

In a recent article *(1)*, Major General D. L. Putt, of the Air Research and Development Command, pointed out that for aircraft traveling at great speeds at high altitudes there is the problem of aerodynamic heating caused by the passage of the airplane through the air at these tremendous speeds. As an example, he stated that at a Mach number of 2.0 at an altitude of 35,000 feet, aerodynamic friction may heat the entire airplane to a temperature of approximately 300°F. Under such conditions solder begins to soften, standard hydraulic fluids (and lubricants) are inadequate, rubber becomes unserviceable, and aluminum alloy becomes much less efficient as a structural material.

Since there is no reason to assume that a Mach number of 2.0 is the top limit of speed which may be developed, it can be expected that these materials problems will grow progressively worse, for temperatures will continue to rise sharply due to increased aerodynamic heating at still greater speeds. Also, when considering lubricants, hydraulic fluids or rubber, the low temperature extremes which may be encountered by these aircraft or missiles, either on the ground or at high altitudes, must not be ignored. Ground temperatures of —65°F. are to be expected, and at high altitudes certain components of aircraft or missiles may be exposed to temperatures well below this figure.

Even from this brief suggestion of future performance requirements it is obvious that in the field of rubber development we have a most formidable job ahead. Only one class of elastomer, the silicone base polymer, is available today which will begin to withstand the temperature extremes mentioned, but unfortunately this elastomer is not sufficiently resistant to the fuels, lubricants, or hydraulic fluids which are being contemplated for use in high speed aircraft and missiles.

It has therefore become necessary to investigate all possible approaches to the problem of elastomers for new aircraft. Three approaches are currently recognized:

(1) The development of new elastomeric materials. This approach, while probably the slowest, offers the greatest hope for a solution to the problems anticipated.

(2) Special compounding of currently available polymers. It is often possible to enhance one desired property of a polymer, for example, low temperature flexibility, at the expense of other properties such as tensile strength, high temperature serviceability, etc. In this manner it may be possible to obtain satisfactory performance in certain critical components.

(3) Design of components either to eliminate the need for elastomeric materials or to make use of those currently available. In many cases elastomeric materials are used only to simplify assembly or to reduce cost of construction. However, in other instances, because of space or weight limitations, vibration, or unusual production tolerances which would have to be maintained, elastomeric materials are indispensable for all practical purposes.

Specific Elastomeric Requirements

It is naturally impossible to discuss here every application for elastomeric materials in aircraft or missiles. However, certain classes of rubber items required find such widespread usage that a brief outline of the problems anticipated with these items should give a fairly general picture of over-all elastomeric requirements. These items include tires, tanks, hose, and a wide variety of seals, gaskets, and diaphragms. To date, the greatest emphasis for aircraft applications has been placed on polymer and compound development for use in the fabrication of hose and seals. However, the other items mentioned are of sufficient interest and importance to justify

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a brief description of problems already encountered or anticipated.

It is conceded that the greatest effort in polymer development and compounding in this country is directed toward the production of superior automotive and truck tires, primarily from GR-S type polymers. The majority of this polymer development work has been conducted by the Office of Rubber Reserve now the Office of Synthetic Rubber of R.F.C., although a great deal of compound development has been carried out by the rubber fabricators. However, very little of this work has been directed specifically toward aircraft tire development. This may be due to the fact that natural rubber has always been available for such critical applications as aircraft tires, and preliminary evaluations indicated that synthetic rubber would not provide the safety or serviceability that could be obtained with natural rubber.

The development and evaluation of an aircraft tire compound becomes a highly complex matter, primarily because of the fact that no prediction of serviceability can be made from a study of the physical properties of the compound developed. Such properties as abrasion resistance, internal heat generation, and even low temperature flexibility cannot be determined in the laboratory in such a manner as to be indicative of tire serviceability. In addition, proper design is probably of equal importance to compound development when attempting to obtain a finished tire with a satisfactory service life.

Briefly summarizing the desirable characteristics of an aircraft tire compound the following are considered of major importance:

(1) Low internal heat generation during flexing. Temperatures as high as 500°F. have been recorded in some casings.

(2) Low temperature flexibility. It is impossible at the present time to predict the degree of flexibility which will be required in terms commonly used by rubber compounders. Temperatures below —100°F. have been recorded in sections of high altitude aircraft already in use, but actual tire temperatures on future aircraft are yet to be determined.

(3) Abrasion resistance. Higher landing speeds and higher inflation pressures require that abrasion resistance of aircraft tires be constantly improved in order to maintain even the relatively short service life now obtained.

(4) Ability to be fabricated from synthetic elastomers. This property is of primary importance during emergency periods.

The finished tire fabricated from the desired compound should also be as light in weight as possible without undue sacrifice in service life. From this it appears that the search for improved aircraft tire compounds is, in reality, a never-ending one.

Similarly, it is desired that aircraft fuel and oil tanks be as light in weight as possible and still be serviceable over the ever-widening temperature range required of aircraft components. In all probability, the development of sealants and inner liners for self-sealing tanks which will be satisfactory at —65°F., and the development of tanks which will withstand temperatures in excess of 300°F., will cause the greatest difficulty.

Problem of Aircraft Fuels

The next two classes of rubber items to be considered may at first glance appear to be unrelated. However, with the exception of a few specific physical properties, the requirements for aircraft hose, and for a wide variety of seals, are the same. These requirements for both hose and seals may also vary somewhat depending upon in which system—fuel, hydraulic or oil—they may find their ultimate use.

Considering each system separately for a moment, it becomes clear that one type of rubber compound will not be satisfactory for all types of fuels currently in use or contemplated. At the present time, the most widely used fuel is aviation gasoline with an aromatic content which may conceivably vary over a range of 0 to 30%. The next most important fuel in use today is jet fuel, which ultimately may contain an even greater aromatic content since jet engines are not as sensitive to fuel composition as internal combustion engines. In all probability, hose and seals may be fabricated from currently available polymers for handling both of these fuels. This, of course, will be true only as long as temperature extremes do not become too great. However, in view of some of the preceding discussion, it is clear that they are rapidly becoming excessive.

To further complicate the problem of fuel handling, many new and highly corrosive rocket and missile fuels are now in experimental use. A good example of this type of fuel is red or white fuming nitric acid, and it is probably needless to say that no synthetic rubber is available today which will withstand, for any prolonged period, the action of this type of fuel. Some success in the fabrication of both hose and seals from Kel-F or Teflon has been obtained by certain manufacturers, but neither of these compounds may be considered a truly elastomeric material.

Hydraulic systems, in general, present a somewhat different picture in that it is conceivable that one hydraulic fluid may ultimately be satisfactory for all aircraft and missile applications. There is also an excellent possibility that pneumatic systems will be used in conjunction with hydraulic systems and the problem of retention of air in these systems may be equal to that of the retention of fluids in more conventional systems.

At the present time, three types of fluids are in general use on aircraft: (1) petroleum base fluids in Air Force equipment, (2) water-glycol mixtures in certain Naval aircraft, and (3) phosphate esters in some commercial aircraft. For military applications, emphasis is currently on the development of fluids which will withstand high temperatures for use in new, high speed aircraft. In addition, there is a strong desire, for purposes of safety, to obtain non-flammable hydraulic fluids for use on both current and new aircraft. Until a final decision is reached as to the type of hydraulic fluid to be most widely used, the development of new rubber compounds for hose and seals in hydraulic applications will not proceed at a very rapid rate.

However, rubber technologists of both the Navy and the Air Force are conducting preliminary development and evaluation of rubber compounds for use in new potential hydraulic fluids. Information obtained is made available to the rubber industry in the event that a particular fluid is adopted for aircraft applications. At the same time, due to the extreme high pressures, which may possibly exceed 5000 psi, and also because of high temperatures anticipated in new aircraft hydraulic systems, considerable attention is being given to metallic hose and seals. The present "O" ring type seal, however, is considered superior to other seal designs and for this reason every effort is being made to develop elastomeric materials suitable for fabrication into "O" rings which will withstand the fluids, temperatures, and pressures required.

Aircraft lubrication systems present problems similar to those outlined for fuel and hydraulic systems. In

TABLE I—SWELL OF TYPICAL VULCANIZATES AFTER 70 HOURS AT 212°F. IN DI-ISOOCTYL ADIPATE

	% Swell
Natural Rubber	590
Butyl	106
GR-S	102
Thiokol	0.3
Neoprene GN	142
Neoprene W	220
Hycar OR-25 (1002)	32
Paracril 18 ("L")	94
Silicone (Silastic 250)	50

certain applications, such as those involving engine oils, elevated temperature problems are already of major importance. The development of turbo-prop and turbo-jet engines has resulted in a demand for lubricants which will perform satisfactorily over the temperature range of —65°F. to above 400°F. Petroleum base oils are inadequate for requirements of this nature, and as a result a series of so-called synthetic base lubricants have been developed or are under development. These synthetic lubricants are generally composed of di-esters, such as di-2-ethylhexyl sebacate, di-isooctyl adipate, and others. Preliminary tests showed that these materials had an extremely deleterious effect on most rubber compounds. Examples of this effect are shown in Table I.

Since these lubricants are already available for use in new production aircraft, the problem of obtaining seals and hose is of immediate importance. For this reason, considerable development work toward solving this problem is now under way at both Government and industrial laboratories.

One final class of seals required on aircraft is of sufficient importance to warrant a brief discussion of the problems encountered. These seals are those which are required primarily to hold air, reduce vibration, or retain such items as plastic domes, windshields, etc. They may include, for example, weather stripping, canopy seals, wheel well and bomb-bay door seals, and others. On present aircraft, in addition to high and low temperature serviceability, the requirement for ozone resistance appears to be of major importance when the service life of the item is considered.

With the exception of the silicone base polymers, no elastomer is available today which combines satisfactory low temperature serviceability with ozone resistance. While this problem is of considerable importance at the present time, it is expected that problems involving high temperature serviceability will transcend those involving ozone resistance for seals of this type on future aircraft.

It must be remembered that requirements similar to those outlined also apply to a wide variety of rubber items not already mentioned, such as diaphragms, wire insulation, shock mounts, anti-icing equipment, and even items of personal equipment, such as breathing oxygen systems and protective clothing for personnel handling corrosive fuels and other chemicals.

Cooperative Research Approach

After examining the characteristics desired of rubber items for use on aircraft, missiles, and related equipment, it is only logical to inquire as to the steps being taken by the rubber industry, Government laboratories, and aircraft or component manufacturers to obtain these characteristics. Referring back to the three approaches outlined previously to the development of satisfactory aircraft components, the very general statement may be made that aircraft and component manufacturers are concerned primarily with design, the rubber industry with compounding and fabrication of new items from commercially available polymers, and the Government laboratories with the development of new polymers.

Comparatively speaking, only small quantities of specialized elastomers are required for aircraft applications. Therefore, since the burden of cost would be too great to expect that rubber fabricators or aircraft manufacturers could undertake extensive polymer development, all of the Services in the Department of Defense, through coordination with the Research and Development Board, have extensive polymer development programs under way. This work is carried out with Government funds by private research groups, universities, and industrial organizations under the guidance of Government chemists and engineers. Examples of this work directed toward meeting the requirements outlined include development of fluorine-containing elastomers, modification of silicone base polymers, investigation of polysulfides and acrylates, synthesis of new plasticizers and other compounding ingredients, and fundamental studies of the mechanism of ozone degradation, oxidation, and low temperature failures.

In addition, in order to assist in and expedite the development of finished items from commercially available and experimental polymers, all of the services accomplish a limited amount of compounding and fabrication. Data obtained are then made available to interested industrial concerns. While not as yet applying to aircraft rubber items, an excellent example of this type of work may be found in the Department of the Navy, Bureau of Ships Rubber Formulary, where rubber compounds meeting the requirements of many of the specifications initiated by that Bureau are presented.

Summary of WADC Activities

Throughout this discussion an attempt has been made to present rubber problems, and their possible solutions, as they apply to aircraft and missiles in general, including those of the Navy and Air Force and perhaps ultimately even commercial airlines. However, to further illustrate compounding and polymer development, and to emphasize the severe service conditions which have already been encountered or are anticipated, a brief review of a portion of the work underway in the Materials Laboratory of Wright Air Development Center may be of interest.

As has been previously indicated, concurrently with the development of new hydraulic fluids, lubricants, and fuels, an attempt is being made to investigate possible elastomeric materials which may be used in contact with these fluids. It was pointed out, for example, that a need exists for new high temperature hydraulic fluids. At the present time, a silicate ester base fluid developed by the California Research Corporation appears to offer the best balance of properties required of a hydraulic fluid and at the same time be serviceable at temperatures in excess of 400°F. A preliminary investigation of elastomeric materials for use in this fluid *(2)* revealed that a properly compounded neoprene polymer might be expected to withstand contact, for a limited period, at 400°F. The compound utilized and the properties obtained are shown in Table II.

It will be noted from the table that physical properties drop off sharply after 24 hours at 400°F., thus indicating that service life of hose or seals may be short

at this temperature. However, hardness change and tensile retention even after 72 hours continuous immersion may permit the use of this compound in certain applications.

A Hycar PA-21 compound was investigated under still more severe conditions *(3)* as shown in Table III. While the compound used may appear to have been extracted directly from the Hycar technical literature, it should be pointed out that the sulfur content of stock was observed to be very critical. Any excess of sulfur resulted in severe softening and swelling while a deficiency of sulfur resulted in excessive hardening. Compounds of this type may be satisfactory for short duration exposures to extremely high temperatures such as may be encountered in missile operation. However, a greatly improved elastomer will be required for long duration exposures at this temperature.

As a result of preliminary investigation, suggested compounds have also been developed for use in the synthetic lubricants and jet engine oils previously mentioned. Data on a low temperature compound for use in synthetic lubricants is shown in Table IV while data for a high temperature compound for use in jet engine oils is shown in Table V. The compound for use in synthetic lubricants (Table IV) was originally investigated at WADC in 1950. Since that time a specification, MIL-R-7362, has been initiated covering superior compounds for use in this and other types of synthetic lubricants. The compound for use in jet engine oils (Table V), however, has only recently been developed and is as yet unreported.

Compounds similar to those mentioned above have also been developed for use in other types of oils, hydraulic fluids, and fuels. As an example, for short duration exposure, compounds for items of protective clothing, hose covers and other applications have been developed from both Butyl rubber and DuPont's Hypalon S-2. These compounds have been found to be useful in contact with red and white fuming nitric acid.

Extensive compounding of new polymers developed under Air Force contracts has also been accomplished in order to investigate curing systems, reinforcing agents, plasticizers, etc. At the present time, the major portion of this polymer development is in the field of fluorine-containing polymers or "fluorelastomers." The reason for this intense interest in "fluorelastomers" is implicit in the structure and properties of polymonochlorotrifluoroethylene and polytetrafluoroethylene. In short, a

TABLE II—BEHAVIOR OF A NEOPRENE COMPOUND IN CALIFORNIA RESEARCH FLUID NO. 52742-R AT 400°F.

(Cure: 20 mins. @ 310° F.)

Neoprene W	100.0
Neozone A	1.5
Thermoflex	1.5
Stearic Acid	0.5
ELC Magnesia	2.0
Zinc Oxide	5.0
NA 22	1.5
SRF Black	40.0
Thermax	40.0
Plasticizer TP-90B	20.0

Original Physical Properties

Tensile	2190
Elongation	320
Compression Set (ASTM Method B)	21
ASTM Bend Loop at —65° F.	OK
Shore A Hardness	65

Aged in California Research Fluid No. 52742-R at 400° F.

Time (Hrs.)	Tensile	Elongation	Hardness
0	2190	320	65
7	1821	240	65
24	1750	230	65
48	820	52	80
72	690	50	80

TABLE III—BEHAVIOR OF A HYCAR PA-21 COMPOUND AFTER IMMERSION IN SILICATE ESTER AT 550°F.

(Cure: 30 mins. @ 310° F.)

Hycar PA-21	100.0
Philblack A	40.0
Stearic Acid	1.0
Trimene Base	1.5
Sulfur	0.5

Time (Hrs.)	Tensile	Elongation	Hardness
0	1700	400	61
2	500	50	71
3	450	45	72

TABLE IV—LOW TEMPERATURE COMPOUND FOR USE IN SYNTHETIC LUBRICANTS

(Cure: 20 mins. @ 310° F.)

Paracril 26	100
Zinc Oxide	5
Age Rite Resin D	2
Sulfur	3
Altax	2
Stearic Acid	1
Philblack A	50
MT Thermax	60
Plasticizer TP-90B	20
Dioctyl Sebacate	10

Original Properties

Tensile	1900
Elongation	200
100% Modulus	640
Shore "A" Hardness	70
ASTM Cold Bend	OK at —65° F.

Aged 7 Days at 158° F. in Specification MIL-O-6085 (AN-O-11) Oil

Tensile Change	—4.2%
Elongation	—22%
Volume Change	+7.4%

TABLE V—HIGH TEMPERATURE COMPOUND FOR USE IN JET ENGINE OILS

(Cure: 20 mins. @ 310° F.)

Hycar OR-15 (1001)	100.0
Zinc Oxide	5.0
Vultac No. 3	5.0
Ethyl Tuads	0.5
Agerite Resin D	5.0
Stearic Acid	1.5
Dioctyl Sebacate	10.0
Philblack A	40.0
Thermax MT	30.0

Properties	Orig.	After 70 Hrs. at 350° F. in Di-Isooctyl Adipate
Tensile (psi)	2150	1600
Modulus at 150% Elong. (psi)	450	540
Elongation (%)	575	255
Compression Set (%) (70 hrs. at 212° F.)	59	——
Shore "A" Hardness	65	60–65
Swell (%)	——	12.1

TABLE VI—SWELLING OF POLY FBA AFTER IMMERSION IN VARIOUS FLUIDS FOR 48 HOURS

Fluid	% Swelling
Toluene	12
Benzene	12
Carbon tetrachloride	12
Xylene	6
Carbon disulfide	0
Water	12
70:30 Isooctane-Toluene	12
Methanol	0
Acetone	84

TABLE VII—COMPARISON OF SWELLING OF POLY FBA AND OTHER VULCANIZATES AFTER 24 HOURS IMMERSION IN DIBROMOETHYLBENZENE

	% Swelling
Neoprene GN	160
Neoprene W	238
Paracril C	45
GR-S	150
Natural Rubber	207
Thiokol	48
Paracril 18-80	200
Butyl	141
Hypalon S-2	270
Poly FBA	—0.75

truly elastomeric Kel-F or Teflon is greatly desired and in an effort to attain this goal, substitution of fluorine for hydrogen in both hydrocarbon and silicone base polymers is now being studied.

Flourine-Containing Elastomers

While the subject of Government-sponsored polymer research is far too large to be covered in a brief presentation, an indication of progress and encouragement may be found by examining one experimental product from a current project.

For several years the Minnesota Mining and Manufacturing Company has been synthesizing and evaluating fluorine-containing elastomers for the Air Force. In that time, a considerable quantity of fundamental data has been obtained and several polymers worthy of further evaluation have been produced. One such polymer, poly 1,1-dihydroperfluoro butyl acrylate, designated more simply as Poly FBA, exhibits sufficiently interesting chemical resistance and physical properties to make it a useful example of the type of work being conducted *(4)*.

The crude polymer itself is a soft elastic material which processes readily on a conventional rubber mill. While curing and reinforcement have not as yet been completely studied, vulcanizates have exhibited tensile strength in excess of 1100 psi with corresponding elongation of better than 400%. The chemical resistance of a typical vulcanizate, illustrated by the percent volume increase after immersion for 48 hours in various fluids, is shown in Table VI.

While these values alone may not appear too significant, a comparison of Poly FBA with other commercially available elastomers when immersed in dibromoethylbenzene, a fluid currently being considered as a non-flammable hydraulic fluid, more clearly illustrates the chemical resistance of the material *(5)*. This comparison is shown in Table VII. While other polymers exhibit a swell of from 45 to 270%, it will be noted that Poly FBA exhibits a slight shrinkage only, clearly indicating the unique chemical resistance of the material.

Conclusion

In conclusion, it is considered desirable to emphasize that many of the problems presented herein must be solved before the full effectiveness and efficiency of current and future aircraft can be realized. For use at extremely high temperatures, there is currently considerable discussion of the possibility of the development of inorganic elastomers, but to date no experimental encouragement has been received along such lines. Therefore, any new approaches in the way of polymer investigations, unique compounding or fabrication methods, or designs, would be of great interest to any of the groups concerned with solving aircraft elastomer problems.

LITERATURE REFERENCES

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(2) Miles, R. H., Development of Rubber Compounds for Use in Silicate Ester Hydraulic Fluids, WADC Materials Laboratory Memorandum Report WCRTE-M5572.

(3) Miles, R. H., Development of Rubber Compounds for Use in Silicate Ester Hydraulic Fluids at 550° F., WADC Materials Laboratory Memorandum Report WCRTE-52-16.

(4) Minnesota Mining and Manufacturing Company, Quarterly Progress Report No. 9, May, 1951 to July, 1951 on Contract AF 33(038)-515.

(5) Miles, R. H., Rubber Compounds for Use in Halogenated Base Hydraulic Fluids, WADC Materials Laboratory Memorandum Report WCRTE-M5608.

Featuring an extra-wide lens, improved nosebridge design, and a soft plastic frame, **Model 440 Eye-Savers** have been introduced by the Watchemoket Optical Co., Inc., Providence 3, R. I. The design of the frame and nosebridge is said to make the goggles feel light and comfortable, even after long hours of wear. The lens exceeds Federal specifications for impact resistance and optical clarity.

Tapered plastic discs designed to eliminate costly and constant painting of traffic lanes in industrial plants are being marketed by the Campro Sales Co., Canton, Ohio. Called **Saf-T-Line Markers**, the discs are three inches in diameter, are injection molded of cellulose acetate butyrate, and are available in white or yellow. They are feather edged, tapering up to a ¼-inch high center, thus warning vehicle operators by sight as well as feel.

Close-quarter operation, permitting greater utilization of factory and warehouse space, is said to have been made possible by development of a **riding-type electric-powered pallet truck** by the Automatic Transportation Co., 149 West 87th St., Chicago 20, Ill. The new truck can maneuver in aisles only 6½ feet wide with a 40 x 48-inch pallet.

Rheology of Concentrated Rubber Solutions

RECENT National Bureau of Standards investigations of the rheology of moderately concentrated rubber solutions using the McKee Consistometer have provided flow data on these substances at higher shearing stresses and rates of shear than heretofore possible with conventional viscometers. Directed by A. B. Bestul of the NBS engines and lubrication laboratory and under sponsorship of RFC's Synthetic Rubber Division, this work and companion measurements with several conventional Bingham capillary viscometers have yielded significant information about the fundamentals of the flow behavior of polymer solutions, which are well known to be non-Newtonian fluids, that is, to exhibit a non-linear relationship between shearing stress and rate of shear.

The development and extensive commercial use of the various types of synthetic rubber have made it necessary to learn more about their flow properties both from the standpoint of industrial processing of the raw rubber and of over-all quality in the finished products. In the past, chiefly because of the lack of suitable instruments, it has been possible to measure the flow properties of bulk rubber only to a very limited extent. High rates of flow could be measured only on relatively dilute solutions; otherwise the material had to be subjected to slow deformation. Through the use of the McKee Worker-Consistometer (Fig. 1), originally developed at the Bureau to study the flow characteristics of greases, measurements can be made for the first time of the viscosities of solutions containing 3 to 100 percent of rubber at widely different rates of flow.

Poiseuille's well-known treatment of capillary flow arrives at the viscosity of a Newtonian fluid by calculating the shearing stress and the rate of shear at the capillary wall and taking the ratio of these two quantities. The expression which gives the shearing stress at the capillary wall in Newtonian capillary flow also gives the shearing stress at the wall in non-Newtonian capillary flow. However, the expression which gives the rate of shear at the capillary wall in Newtonian capillary flow does not give the actual rate of shear at the wall in non-Newtonian capillary flow. Even so, in non-Newtonian flow the quantity obtained from this expression is still a useful quantity and is usually referred to as the nominal rate of shear. It plays the role of a correlating function because if the same liquid is investigated in several capillaries of different dimensions a given value of the shearing stress at the wall must always coexist with the same value of the nominal rate of shear.

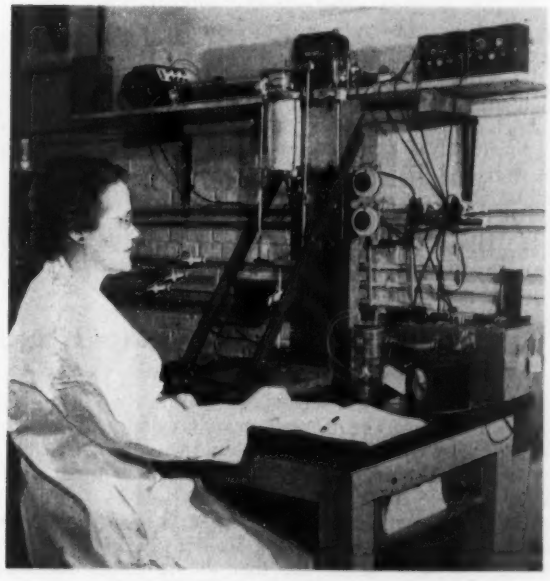

FIG. 1—View of the McKee Worker-Consistometer used at the National Bureau of Standards to investigate the rheology of rubber solutions.

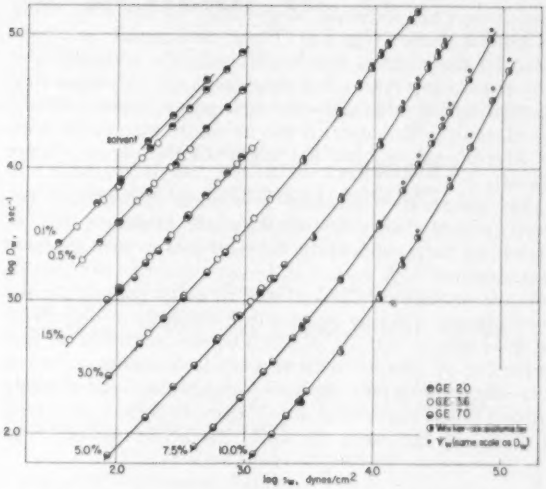

FIG. 2—Graph showing logarithmic plots of nominal rate of shear at the capillary wall (D_w) versus shearing stress at the wall (S_w) for data obtained on eight different GR-S solutions using three different Bingham viscometers and the McKee consistometer.

When solutions of 3 to 10 percent GR-S rubber are examined with the two types of viscometers, plots of nominal rate of shear versus shearing stress at the wall coincide. Thus, the validity of the various corrections applied to the consistometer data (such as that for the resistance of the pistons to sliding in the cylinders) is assured in this region, which lies in the lower part of the ranges of viscosity and of shearing stress.

In Newtonian flow the general relation existing between rate of shear and shearing stress is one of simple proportionality; the ratio of rate of shear to shearing stress, which may be called the fluidity, is a constant. In attempting to express the corresponding (non-linear) relation existing in non-Newtonian flow a common procedure is to add to the constant further terms of a power series in shearing stress, of which the constant is the zero-order term. All quantitative theories of non-Newtonian flow in polymer solutions indicate that in the limit of zero shearing stress the non-linear relation must reduce to the linear one of Newtonian flow. This requires that the derivative of fluidity with respect to shearing stress become zero at zero shearing stress. This condition can exist only if there is no first-order term in

the extended power series, and the simplest compatible relation is one which adds only the second power term in shearing stress.

Combination of data from the McKee consistometer and from Bingham viscometers results in flow data for 0.1 to 10 percent solutions of GR-S rubber in *o*-dichlorobenzene over an unusually large range of shearing stress and rate of shear (Fig. 2). These data cannot be represented by the relation which adds only the second-power term in shearing stress, but they do fit the corresponding equation which adds only the first-power term. Other, less extensive, flow data in the literature also agree with the first-power relation but not with the second-power relation.

This situation constitutes a serious discrepancy between present theory and experiment. Because the experimental data supporting the first-power relation have been obtained with several different types of viscometers, they are probably valid. If the theories underlying the second-power relation are valid, a possible resolution of the discrepancy may be as follows: the condition of zero derivative of fluidity with respect to shearing stress at zero shearing stress is approached only at shearing stresses much lower than those examined experimentally to date. If this were the case, the second-power relation would fit experimental data taken at shearing stresses much lower than those already examined, although it does not fit present data. In this case the first-power relation should not be compared with theory since the region of validity would be known to be beyond the range of applicability of the theory. If on the other hand the first-power relation is valid at infinitesimal shearing stresses, the concepts of the theory underlying the second-power relation will have to be modified.

The questions posed here can be answered only by further flow measurements at shearing stresses lower than have been made to date. Further work in progress at the National Bureau of Standards, primarily on bulk rubbers and high-concentration solutions, is expected to throw additional light on the rheology of polymers and their solutions.

(EDITOR'S NOTE: For further technical details on the flow behavior of polymer solutions, the reader is referred to the article on "Flow Behavior of Concentrated GR-S Rubber Solutions," by A. B. Bestul and H. V. Belcher, which appeared in the June, 1950, issue of the *Journal of Colloid Science*. A complete description of the McKee Consistometer was published in the May, 1948, issue of the *ASTM Bulletin*.)

Major Causes of Color Discoloration on Building Wire

WIRE discolorations have been a considerable source of trouble and expense to many insulated wire manufacturers. In an effort to provide wire companies with additional information concerning this problem, the Solar Compounds Corporation, of Linden, N. J., recently launched a laboratory investigation to determine the major causes of discoloration of lighter colors, such as white, gray and yellow, on rubber-covered building wire and cable. The company's report on the investigation follows:

Discoloration may occur during either processing or after the wire has been completed and placed in stock. It may show up on the surface of the wire as a yellow to brown stain or as dark gray to black spots. It is more likely to occur during the summer months, but it can occur at any time. The most serious time is during storage because the wire has been cut into lengths, coiled and packaged for sale, making refinishing difficult and expensive.

In the laboratory investigation it was decided to use canvas strips rather than short lengths of wire because they provided a larger area for studying the various combinations of saturating compounds, finishing compounds, paints and wax dressings. Test specimens were prepared by saturating the canvas and applying a thin coat of finish by means of a doctor blade. Wax top dressing was applied over the paint by saturating a piecé of cloth with wax and coating the painted surface. The completed specimens were placed in an air oven at 120°F. Visual observation and comparison of exposed and unexposed specimens were made after 13, 24, 72, 96, and 168 hours. In extreme cases, serious discoloration was apparent after 24 hours. As a result of these tests the following data was learned:

DISCOLORATION DURING STORAGE

(1) Effect of saturating compounds: It was found that certain types of asphalt bases used in the manufacture of the saturants had a tendency to cause discoloration. This can be controlled by the proper selection of the asphalt base. It was also found that some waxes, particularly low melting point, poorly refined types, are a decided factor in causing discolorations when used in the saturating compounds.

(2) Effect of finishing compounds: None of the finishing compounds examined proved to be a major cause of discoloration.

(3) Effect of paints: Properly formulated paints do not seem to discolor. However, they act as a background for the discoloration. In the experiments the effect was neutral.

(4) Effect of wax top dressing: Waxes used as top dressing and anti-sticks were found to be the major cause of discoloration. High free oil content and low melting point varieties caused the most trouble.

DISCOLORATION DURING PROCESSING

(1) Excess saturant left in the braid.
(2) Poor coverage of saturant by finishing compound.
(3) Active solvent constituents in the paint.
(4) Temperature of application of wax top dressing too high.
(5) Improper cooling of the wire before placing on the take-off reel.

The company points out that the investigation data can serve only as general information for wire companies, since there is no hard and fast rule which covers all cases.

Division of Rubber Chemistry, A. C. S., to Hold Fall Meeting in Buffalo, N. Y.

THE Division of Rubber Chemistry of the American Chemical Society will hold its 61st Meeting at the Hotel Statler in Buffalo, N. Y., on October 29 to 31. The Buffalo Rubber Group will act as hosts for the meeting with John G. Augenstein, of the U. S. Rubber Reclaiming Co., as chairman of the Local Arrangements Committee.

The meeting will feature the presentation of 25 technical papers, again grouped by subject matter as much as possible, divided into four technical sessions. Other features will include a luncheon-meeting of the 25-Year Club, a business meeting, presentation of the Charles Goodyear Lecture, the suppliers' cooperative cocktail party, and the divisional banquet. H. F. Van Valkenburgh, of the Dunlop Tire & Rubber Co., will preside as chairman at the 25-Year Club meeting, which will be held at the Hotel Statler at 12 noon on Wednesday, October 29.

Simmons to Give Goodyear Lecture

The Charles Goodyear Lecture, entitled "Out of the Past," will be delivered by Dr. H. H. Simmons, until recently president of the University of Akron and now associated with the Goodyear Tire & Rubber Co. The lecture will be given during the technical session on Thursday morning, October 30. Presentation of the Charles Goodyear Medal will be officially made to Dr. Simmons during the divisional banquet on the evening of the same day.

Free time has been provided for Thursday afternoon, October 30, so that those desiring to do so may visit any one of five plants in the Buffalo area. These plants are: (1) Hydroelectric Plant of the Niagara Mohawk Power Co.; (2) Coated Fabrics Division of the Carborundum Co.; (3) Radio and Television Division of the Sylvania Electric Products Co.; (4) Atlas Plant of the Socony-Vacuum Oil Co.; (5) Plant No. 2 of the U. S. Rubber Reclaiming Co. Those desiring to visit any of these plants must signify such intentions prior to the meeting itself. Registration for the plant visits may be made in writing to John G. Augenstein, U. S. Rubber Reclaiming Co., P. O. Box 365, Buffalo 5, N. Y. A small charge will be made for bus transportation to the plants.

Special Ladies Program Planned

A special Ladies Entertainment Program is also being arranged, with Mrs. C. H. Peterson in charge of the program. Interesting visits to various activities in the Buffalo area are being arranged, and full details will be available at the registration desk at the Hotel Statler. Pre-registration slips are being provided by mail to all members of the Rubber Division and they are urged to return these slips to the proper authorities as soon as possible.

Abstracts of the 25 papers scheduled for presentation, together with their authors and company connections, follow:

Program of the
DIVISION OF RUBBER CHEMISTRY
AMERICAN CHEMICAL SOCIETY
Hotel Statler, Buffalo, N. Y.
October 29-31, 1952

Wednesday Morning—October 29
9:00 A.M.—Registration
12:00 Noon—25-Year Club Luncheon, Hotel Statler

Wednesday Afternoon—October 29
2:00 P.M.—Introductory Remarks by Waldo L. Semon (Goodrich), Division Chairman
2:10 P.M.—Technical Papers

Thursday Morning—October 30
9:00 A.M.—Technical Papers
11:45 A.M.—Charles Goodyear Lecture by Dr. H. H. Simmons

Thursday Afternoon—October 30
2:00 P.M.—Plant Visitations

Thursday Evening—October 30
5:00 P.M.—Suppliers' Cooperative Cocktail Party, Hotel Statler
7:00 P.M.—Divisional Banquet, Hotel Statler

Friday Morning—October 31
9:00 A.M.—Technical Papers
11:20 A.M.—Business Meeting

Friday Afternoon—October 31
2:00 P.M.—Technical Papers

ABSTRACTS OF PAPERS

Wednesday Afternoon—October 29

2:00 P.M.—1—Introductory Remarks, *Waldo L. Semon.*

2:10 P.M.—2—A Study of GR-S Synthetic Rubbers Extended with Rosin Type Acids. *L. H. Howland, J. A. Reynolds and R. L. Provost (Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn.). (Paper will be presented by Mr. Howland).*

A study of copolymerization of butadiene with styrene in the presence of large amounts of emulsifier led to an investigation of the rubber properties of polymers extended with the corresponding emulsifier acids in a manner similar to that reported for the extension of GR-S type polymers with petroleum oils. This included the investigation of synthetic rubbers extended with rosin and rosin derivatives. These materials have been found to be equivalent to the petroleum oils in extending efficiency but are considerably superior in many other respects. In laboratory tests on tire tread and carcass vulcanizates from butadiene-styrene copolymers extended with rosin type materials, substantial improvements were found in room temperature and hot tensile strength, abrasion resistance, and resistance to cut growth and heat build-up. Preliminary service tests have confirmed many of the improvements obtained in the laboratory.

2:25 P.M.—3—The Effect of Chemical Composition of Petroleum Processing Oils on the Physical Properties of Oil-Enriched Rubbers. *K. V. Weinstock (General Tire & Rubber Co., Akron, Ohio), E. B. Story (Polymer Corp., Sarnia, Ont., Canada), and J. S. Sweely (Sun Oil Co., Norwood, Penna.). (Paper will be presented by Mr. Weinstock).*

A series of petroleum oils have been evaluated as plasticizers for high Mooney viscosity GR-S polymers. The oils selected cover the range of chemical composition usually found in rubber processing oils and varied in aniline point from a low of 29 for the relatively aromatic oil to a high of 222 for the relatively paraffinic oil. Chemical composition and physical properties have been obtained on these oils. The two molecular weight levels of the oils studied show that there is a minimum molecular weight necessary to obtain the best over-all balance of properties from an oil-enriched rubber. All of the oils examined were compatible with the high Mooney viscosity GR-S in loadings up to 100 parts of oil per 100 parts of rubber.

The effect of chemical composition of the oil on the stress-strain properties of the vulcanizates is small. The aromatic oils show slightly better tear resistance, higher elongation and flex crack resistance. The paraffinic oils have better color, higher resilience and improved low temperature properties.

No outstanding differences were noted in the mixing, extrusion, or fabrication of the compounds prepared with the various oils. The stocks were mixed on the same Banbury cycle and extruded through the same die.

Test tires built from the special oil-enriched rubbers have been tested using commercial oil-enriched rubbers as controls.

2:50 P.M.—4—Effect of Various Oils in the Oil-GR-S Masterbatch on the Breakdown of the Polymer. *W. K. Taft, June Duke, A. D. Snyder, M. Feldon, and R. W. Laundrie (Government Laboratories, University of Akron, Akron, Ohio). (Paper will be presented by June Duke).*

The development in the rubber industry whereby high viscosity GR-S is masterbatched with oils has led to the investigation of various kinds of oils from several sources. The literature has many references to the effect of some of these oils on the properties of the cured rubber stocks, but only casual reference is made to the effect of the oil on the molecular size of the polymer.

High viscosity, cold GR-S polymerized to contain gel or to be gel free, was masterbatched with various commercial oils. Heat or Banbury treatment of the masterbatches has shown that the effect of the oils on the solubilizing of the gel and the breakdown of the benzene-soluble fraction of the polymers can be very different. The Mooney viscosity of the polymer also is affected differently by the several oils. Data are presented which appear to indicate that the method of processing of the stock in the factory may have to be adjusted for the type of oil that is used in masterbatching the polymer.

Fractions, as defined by the Rostler method of analysis, of several oils were prepared and tested. The results indicate that such fractions of the several oils tested all differ in their effect on the rate of change in polymer breakdown, condensation, or Mooney viscosity when the masterbatched polymer is subjected to heat or Banbury treatment. No correlation was found between the effects noted and the gravity, viscosity, viscosity index, or bromine number of the oils. Loss of oil due to high volatility can be predicted by low viscosities of the oil.

(Note: The work reported was carried out under the sponsorship of the Office of Synthetic Rubber, Reconstruction Finance Corporation, in connection with the government synthetic rubber program.)

3:10 P.M.—5—The Processing of Oil-Extended and LTP GR-S Black Masterbatch. *H. L. Ericson and L. D. Carver (Continental Carbon Co., Amarillo, Texas). (Paper will be presented by Mr. Ericson).*

During the past few years considerable work has been presented on the technical aspects of the manufacture of low temperature GR-S and HAF black GR-S masterbatch. With the more recent discovery of the oil-extended GR-S polymers by the General Tire and Rubber Company Research Division, renewed interest has been shown in this work but most of the papers published to date have dealt mainly with raw polymer studies, the carbon gel complex, and some tire test results. The effects of compounding and processing variables, particularly on the oil-extended polymers, have been investigated but little data has been published.

This report is concerned with the results obtained from a laboratory investigation of the effects of compounding and processing variables on HAF black low temperature GR-S masterbatch and two oil-extended low temperature polymers—GR-S X-628 and GR-S X-629. The latter two polymers contain 25 parts processing oil per 100 parts LTP GR-S and the GR-S X-629 also contains 50 parts of HAF black in addition to the 25 parts processing oil which is incorporated during manufacture. The results of this study indicate that numerous factors in compounding and processing affect the quality and performance of the black LTP GR-S tread stocks.

Using base formulations and procedures with Size "B" laboratory Banbury mixing, the effects of Banbury cooling water temperatures, stock discharge temperatures, rotor speeds, milling cycles, remilling, and extrusion were investigated. Particular attention is given to the effects of these variables on the physical properties of the compounds, laboratory angle abrasion losses, flex cracking, and processing characteristics. Several tables and graphs are shown to illustrate these variables.

3:35 P.M.—6—Preparation, Properties and Evaluation of Diazo-Initiated Polymers. *J. M. Willis, Glen Alliger, B. L. Johnson, and W. M. Otto (Chemical and Physical Research Laboratory, Firestone Tire & Rubber Co., Akron, Ohio). (Paper will be presented by Mr. Willis).*

A diazo-initiated system of polymerization has been developed at 122° F. using a stabilized salt of diazotized *p*-nitroaniline (Nitrazole CF) as initiator. Tire tests of 70/30 BD/ST polymer have shown tread wear approximating 41° F. "cold rubber." Laboratory tread stock physical properties are equal to the 41° F. polymer and superior to GR-S. Present results indicate that a polymer equivalent to "cold rubber" for tread use can be produced at 122° F. Factory experience with 122° F. Nitrazole CF polymers (BD/ST) indicated an instability during high temperature processing. Santovar O was found to repress gel formation and give better all-around processing.

The improved properties of the Nitrazole CF rubber appear to be the result of increased linearity and less cross-linking in the polymer chain together with an improved molecular weight distribution. This macrostructural change has been shown by a study of the relationship between intrinsic viscosity and osmotic molecular weight and by fractionation of the polymer. This is believed to be the first instance in the study of synthetic emulsion polymers where it has been shown that a change in the polymerization initiator has led to a structural change in the product.

Butadiene/styrene copolymers made in the Nitrazole CF system at 41° F. with long reaction times (80 hrs., approximately) show very high tensile strengths. This is consistent with their X-ray diffraction patterns which show ordering. Other properties are equal to or poorer than the 122° F. Nitrazole polymer, possibly as a result of the long reaction times.

3:55 P.M.—7—Nonionic, Anionic and Cationic Emulsifiers in Butadiene-Styrene Copolymerizations. *A. F. Helin and J. M. Gyenge (Government Laboratories, University of Akron, Akron, Ohio), D. A. Beadell (General Aniline & Film Corp., New York, N. Y.), J. H. Boyd (Consultant, 250 Park Avenue, New York, N. Y.), and R. L. Mayhew and R. C. Hyatt (General Aniline & Film Corp., Easton, Penna.). (Paper will be presented by Mr. Beadell).*

The type and concentration of the emulsifying agents used in the preparation of synthetic elastomers by the emulsion polymerization technique are important factors in determining polymerization rates, latex stabilities, and polymer properties. The objective of the present program was to correlate by a systematic study, if possible, the above effects with the chemical structure and solubility characteristics of the emulsifiers.

A series of nonionic, anionic, and cationic synthetic surfactants, most of which were ethylene oxide adducts of alkyl, aryl, and alicyclic compounds containing various functional groups, were tested on a laboratory and pilot plant scale as emulsifiers in the polymerization of butadiene and styrene according to typical GR-S formulas.

The anionics yielded good polymerization rates with satisfactory latex stability, the cationics afforded good rates with

poor latex stability, and the nonionics in general gave poor rates with variable latex stability. The polymers were equal or inferior to GR-S made at the same temperature as that for the experimental emulsifiers.

The data that were obtained should afford a choice of emulsifiers for the preparation of fatty or rosin acid-free latices or polymers for special purposes and should provide a background and starting point for further studies of these types of emulsifiers.

(Note: The work reported was done at the Government Laboratories, University of Akron, Akron, Ohio, under sponsorship of the Office of Synthetic Rubber, Reconstruction Finance Corporation.)

4:15 P.M.—8—Peroxides from Autoxidized Methyl Oleate and Linoleate as Initiators in the Preparation of Butadiene-Styrene Synthetic Rubber. ***Daniel Swern, Joseph E. Coleman, H. B. Knight (Eastern Regional Research Laboratory, Philadelphia, Penna.), K. T. Zilch, H. J. Dutton, and J. C. Cowan (Northern Regional Research Laboratory, Peoria, Ill.), and J. M. Gyenge (Government Laboratories, University of Akron, Akron, Ohio). (Paper will be presented by Mr. Swern).***

In a Dextrose-Free Recipe at 41° F. for the copolymerization of butadiene and styrene, using 6 x 10^{-4} moles of initiator per one hundred grams of monomers, methyl oleate peroxide (MOP) and methyl linoleate peroxide (MLP) gave higher polymerization rates and conversions than cumene hydroperoxide (CHP), and they gave as high rates of conversion as *p*-menthane hydroperoxide (PMHP). In a Peroxide-Dextrose Recipe at 122° F., at both low and high dextrose levels, only about one-half as much MOP as CHP or PMHP was employed on a molar basis to achieve the same conversion and polymerization rate. In a low Dextrose-Redox Recipe at 41° F., using 6 x 10^{-4} moles of initiator per one hundred grams of monomers, MLP gave slightly higher conversions than CHP or PMHP, but in the Amine Recipe at 41° F., MLP gave lower conversions.

(Note: Part of the work reported was carried out under the sponsorship of the Office of Synthetic Rubber, Reconstruction Finance Corporation, in connection with the government synthetic rubber program.)

4:35 P.M.—9—Tensile Properties of Films from GR-S Latex Polymerized at Low Temperatures. ***R. W. Brown, W. E. Messer, and L. H. Howland (Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn.). (Paper will be presented by Mr. Brown).***

Studies were made on the influence of a number of polymerization variables on the tensile strength of vulcanized films from low temperature high solids GR-S latices. Previous reports of film tensiles on the order of 3000 pounds per square inch for latices of 70/30 butadiene/styrene charge ratio were confirmed. The levels of accelerator necessary for optimum vulcanized properties were found to be considerably lower than those normally used, particularly for latices shortstopped with dithiocarbamate salts. Microscopic coagulum found in some latex samples had a pronounced effect in decreasing film tensile of vulcanizates. Cured films from latices emulsified with mixtures of fatty acid and rosin soap possessed considerably better tensile strengths than those from latices using all fatty acid soap emulsification. Wide variations in Mooney viscosity had relatively little effect on ultimate film properties. Incorporation of small amounts of lignin into the latex as the ammonium or sodium salt decreased cure rates of films and aided in giving more reproducible tensile results. Both lignin and the sodium salt of cresyl monosulfide improved the aging characteristics of films.

Thursday Morning—October 30

9:00 A.M.—10—A Study of Electrical Contact Potentials Produced During Banbury Mixing. ***R. S. Havenhill, L. E. Carlson, H. F. Emery, and J. J. Rankin (Research Laboratories, St. Joseph Lead Co., Monaca, Penna.). (Paper will be presented by Mr. Havenhill).***

The use of the electrostatic probe and associated equipment in monitoring and recording the electrical potentials of a rubber batch during mixing has been reported previously. It was shown that these potentials were related to the mixing behavior of the batches. Further studies have been made using the original equipment in which the probe was located in the side of the mixing chamber between the two rotors. Additional work has been carried out with the probe located in the door of the mixing chamber. In this new location the potential was measured where the rubber was squeezed between the rotor and the shell and maximum pressures and shearing stresses were encountered. Differences in both magnitude and polarity of charge were found between the two probes.

Contact potential studies showed a positive charge on coated zinc oxide and coated calcium carbonate pigments. The resulting electrostatic attractive forces between the positive pigment and the negative rubber are thought to be responsible for the faster incorporation, better dispersion, and lower power consumption. Electrostatic mixing charts for a chemical plasticizer indicate the plasticizing action to be an oxidation reaction similar to mastication. Electrostatic mastication charts are shown for vinyl chloride and silicone rubber.

9:20 A.M.—11—Active Carbons as Anti-Stain Agents for Reclaimed Rubber. ***J. J. Keilen and W. K. Dougherty (West Virginia Pulp and Paper Co., Charleston, S. C.). (Paper will be presented by Mr. Keilen).***

The discoloration of light colored stocks due to migration of staining materials from reclaimed rubber in adjacent stocks, as in white sidewall tires, can be reduced by incorporating active carbon in the reclaim. Over a range of 6 to 15 parts of active carbon per 100 parts of GR-S reclaim or blends of GR-S with up to 50% of natural rubber reclaim, particle size within the standard sieve range and moisture content up to 28% have no effect on the anti-stain activity of the carbon. In the standard sieve range, particle size does not affect Mooney viscosity of the stock.

Acidic active carbons are more effective in GR-S reclaim and in blends with natural rubber reclaim than are alkaline carbons. In natural rubber reclaim the effect of pH is negligible. Variation in molasses value of Type A carbon, a measure of decolorizing ability, has no apparent effect on anti-stain activity. The anti-stain activity of Type B carbon is related to iodine value, a measure of power to remove tastes and odors from water, with increased iodine value giving greater anti-stain effect. Among commercial grades of active carbons, Type A is more effective than Type B, especially in blends containing high percentages of GR-S. The effective specific gravity of active carbon in rubber is 1.45.

9:40 A.M.—12—Blends of Chlorosulfonated Polythene with Butadiene-Styrene Copolymers. ***W. J. Remington, J. J. Ondrejcin, and George H. Bowers (Polychemicals Department, DuPont Experimental Station, Wilmington, Del.). (Paper will be presented by Mr. Remington).***

Vulcanizates of chlorosulfonated polythene possess unusual mechanical durability and chemical stability. When compounded in blends, chlorosulfonated polythene is capable of improving butadiene-styrene copolymers in important respects. GR-S 101 blends containing 25% or more chlorosulfonated polythene are of particular interest. In tread stock compositions the addition of chlorosulfonated polythene improves ozone resistance, abrasion resistance, and heat aging characteristics.

The development of a suitable curing system for these blends presents unusual problems because of gross differences in the chemical structures of the individual elastomers. The use of conventional GR-S formulations gives poor stability, presumably because dehydrohalogenation of the chlorosulfonated polythene is induced by zinc chloride that is formed. Improved vulcanizates are obtained in blends when all zinc oxide is replaced by litharge. By minor variations in the rest of the composition, vulcanizates can be obtained that exploit the better characteristics of both elastomers. Field evaluations of these blends have been started in connection with a number of uses where ozone resistance is particularly important.

10:05 A.M.—13—Ozone-Resistant Chlorosulfonated Polythene Blends. ***R. T. Currin, W. J. Remington, and W. B. Clark (Polychemicals Department, DuPont Experimental Station, Wilmington, Del.). (Paper will be presented by Mr. Currin).***

Unsaturated elastomers are susceptible to ozone attack, and the resulting cracks, if not severe in themselves, are easily propagated by the dynamic conditions frequently encountered in elastomer service. A surprising degree of resistance to the initiation

of ozone cracks can be obtained in vulcanizates comprising blends of major portions of the unsaturated elastomers with chlorosulfonated polythene, a new elastomer which is highly resistant to such degradation.

The proportion of chlorosulfonated polythene required for lasting protection against the start of ozone cracking is dependent upon exposure conditions, such as the stress on the sample, the temperature, and the ozone concentration. When stresses are as low as 50 psi, some blends containing only 25% chlorosulfonated polythene are resistant at room temperature to high ozone concentrations for long periods. At high stresses or temperatures, however, higher portions of chlorosulfonated polythene are needed for comparable performance.

These results raise fundamental questions regarding the mechanism by which protection against ozone is obtained. They also emphasize the importance of minimizing stress concentrations in fabricated articles, and of considering the effect of slightly elevated service temperatures on ozone attack. In conclusion, the data provide a basis for formulating compositions of any desired degree of ozone resistance.

10:30 A.M.—14—Compounding of Silicone Rubber—II. *Walter B. Spencer, William B. Davis, and F. L. Kilbourne, Jr. (Connecticut Hard Rubber Co., New Haven, Conn.), and Juan Montermoso (Office of the Quartermaster General, Department of the Army, Washington, D. C.). (Paper will be presented by Mr. Kilbourne).*

In this paper data are presented showing: (a) improvements in physical properties of silicone compounds, (b) the effect of time and temperature on curing of silicone compounds, (c) the effect of pigment surface pH and moisture on physical properties, (d) a new method for simultaneously reinforcing and vulcanizing silicone rubber in the absence of peroxidic agents.

The reinforcing properties of silica aerogel, titanium dioxide, pure aluminum oxide and a new hydrophobic silica in dimethyl silicone elastomer are compared; unusually high tensile strengths and elongations are obtainable with aluminum oxide and hydrophobic silica.

The rate of cure of a typical silicone compound has been studied; a press cure of 15 minutes at 230° F. is recommended.

10:55 A.M.—15—Purchase and Inspection Standards for Dry Natural Rubber. *W. J. Sears (Rubber Manufacturers Association, Inc., New York, N. Y.) and C. O. Miserentino (Dunlop Tire & Rubber Corp., Buffalo, N. Y.). (Paper will be presented by Mr. Sears).*

In purchasing natural rubber there is no means of determining its acceptability from a technical standpoint before title passes from the seller to the buyer. For other materials used by the rubber industry, there have been developed scientific methods of material evaluation, and enforceable purchase specifications are written for technically determining their acceptability.

The best available enforceable purchase specifications for natural rubber are the use of the standard contract, type samples, type descriptions and packing specifications prepared by the Crude Rubber Committee of the Rubber Manufacturers Association. The use of these standards, together with adequate inspection procedures, will assure factories of receiving contract grades.

Naked eye inspection is used to compare samples taken from rubber shipments with official RMA type samples for resemblance. During 1951, about 42% of nearly one-half million long tons of natural rubber imported were off-grade; 11% were non-bona fide tenders. Currently, outstanding claims against Far Eastern shippers for off-grade rubber amount to approximately $1,500,000. Practically all natural rubber produced can be physically graded into one or another of the RMA types and grades. Many Far Eastern packers and shippers refuse to grade their rubber according to these standards. Under these conditions, many factories are accepting rubber of a lower grade than they ordered and paying more for their rubber than its true value.

The RMA Crude Rubber Committee is sponsoring a series of nation-wide educational seminars for the rubber manufacturing industry to acquaint them with these standards. Provided more companies in the industry adopt them and insist upon proper deliveries, there should be a general improvement in the quality and uniformity of natural rubber shipments from the Far East.

In addition, it is believed that companies using these standards will have an equal opportunity to be competitive from a rubber cost standpoint. It is hoped that rubber chemists will take a renewed interest in rubber procurement and work with their buyers to improve the quality and packing of the shipments.

This industry effort will not solve the problem of technically non-uniform natural rubber, but should assure companies of better deliveries and provide greater opportunity for lowering natural rubber cost.

11:15 A.M.—Charles Goodyear Lecture by Dr. H. H. Simmons.

Friday Morning—October 31

9:00 A.M.—16—Characterization of Cord Fatigue in Tires. *K. R. Williams, J. W. Hannell, and J. M. Swanson (Rayon Research Division, Textile Fibers Department, E. I. du Pont de Nemours & Co., Inc., Richmond, Va.). (Paper will be presented by Mr. Williams).*

The mechanism of fatigue failure of rayon cords was studied by the characterization of cords removed from fatigued but unfailed passenger tires. Fatigue failure was found to stem from a progressive loss in cord strength in the flex zone. This loss in strength was linear with tire mileage and was caused by broken filaments. Studies of single fiber strength and stiffness, cellulose chain length and fiber abrasion were also made on fatigued tire cords.

The linear loss in cord strength was induced in the laboratory with an in-rubber fatigue test by adjusting the degree of cord extension and compression in the tester to approximate the values found in the sidewall of a passenger tire. Under these conditions the tester gave good correlation with tire data with respect to the relative rate of strength loss of cotton and rayon cords and the effect of cord twist on fatigue life.

9:25 A.M.—17—Study of the Factors Affecting the Friction of Tread Compounds on Ice. *C. S. Wilkinson, Jr. (Goodyear Tire & Rubber Co., Akron, Ohio).*

The use of various synthetic polymers in tire treads makes it highly desirable to have some means of evaluating their frictional properties on ice. Because of the natural variability of conditions encountered in highway tests a laboratory method in which variables could be controlled was developed.

It was found that differences observed in the frictional characteristics of a particular tread stock due to variations in load and temperature may exceed differences between it and stocks from other polymers under identical test conditions. The velocity of sliding, including the special case of "static friction" where the velocity is zero, was also found to have a considerable effect. When these variables were controlled, there remained differences in compounds due to the polymer used or some physical characteristic of the sample. The hardness seemed to be the physical property having the greatest effect upon the ice friction.

Since considerable difficulty was experienced in producing a uniformly satisfactory ice surface for experimental purposes, some space has been devoted to consideration of this special phase of the experiment.

From experimental observations made it is possible to draw some conclusions concerning the proper method of testing and comparing compounds. In addition, some insight into the mechanism of the frictional forces may be obtained. A theory prevalent in the field of the friction of metals that friction consists of a process of alternately welding and breaking junctions between surface asperities seems to be consistent with most of the observed phenomena in the case of rubber and ice. The fact that the coefficient is a variable, depending on such factors as pressure, temperature, and velocity, is explainable on the basis of the water film formed when rubber slides on ice. The existence of this film may also account for the differences between so-called "static" and "kinetic" friction.

9:50 A.M.—18—Behavior of Motor Mounting Compounds Under Continous Shear Load. *G. L. Hall, F. S. Conant, and J. W. Liska (Chemical and Physical Research Laboratory, Firestone Tire & Rubber Co., Akron, Ohio). (Paper will be presented by Mr. Hall).*

A description is given of an apparatus and method for testing elastomers to be used under continuous load. A shear type loading, corresponding to most service applications, is used. Serviceability is judged on the basis of two parameters—the amount of creep under continuous load and the change in tangent

modulus. Test duration and test temperatures simulating service conditions are utilized, thus minimizing the dangers inherent in extrapolations from the results of highly accelerated tests.

Creep rate was found to be practically unaffected by the changes in applied stress or in sample length studied. A Butyl rubber compound tested showed excellent retention of modulus and comparatively low creep after long periods of time under load. A butadiene/acrylonitrile compound also showed a low creep but a very high degree of stiffening. Antioxidant studies in GR-S showed PBNA and BLE to be equivalent to each other. An increase in PBNA content made a slight increase in resistance to heat stiffening, especially at 70° C. In Hevea compounds, Santoflex B, BLE and PBNA appeared to be equally effective. The difference in aging characteristics between Hevea and GR-S was shown clearly.

10:10 A.M.—19—Electrical Conductivity of Rubber-Carbon Black Vulcanizates. ***B. B. S. T. Boonstra and E. M. Dannenberg (Godfrey L. Cabot, Inc., Boston, Mass.). (Paper will be presented by Dr. Boonstra).***

Electrical conductivity measurements are reported on a group of fine particle size reinforcing carbon blacks at various loadings in natural rubber, "cold" GR-S, and Neoprene GN-A.

For practical applications, a conductive rubber stock should have the following characteristics: (a) Low resistivity, (b) Small changes in resistivity with temperature, and (c) Small changes in resistivity on deformation.

The retention of conductivity after deformation is a very important property. It is well known that rubber-black compounds containing the usual commercial grades of black undergo tremendous changes in electrical resistance even at small deformations of the test specimen. Since these properties depend for a great part on the type of black used in the compound, the most commonly used conductive blacks were tested together with two new blacks, Vulcan C and Vulcan CC.

The most conductive commercial grade of channel black shows some conductivity even at loadings as low as 10 parts per 100 parts of rubber, whereas the other blacks at this loading have resistivities which do not differ greatly from the pure gum values. The conductivity of Vulcan CC mixes showed the smallest temperature dependence.

The retention of conductivity under deformation of stocks containing 50 parts of black in natural rubber was extensively studied. Three different types of deformation were applied: slow elongation, repeated rapid elongation, and repeated rapid compression. During the slow elongation test, the resistivity plotted versus elongation goes up rapidly at first, through a maximum the height and position of which is dependent on the type of black. Repeated rapid elongation results in less drastic changes in resistivity and shows characteristic differences in resistivity level among the various blacks.

Compression results in very large changes in resistance, especially at the first few deformation cycles. The rate of compression plays an important part in the rise in resistivity resulting from it. The results tie in with the theory that conductivity is caused by conductive paths which are partly destroyed by deformation but, at the same time, are constantly being reformed. A new type of black, Vulcan CC, was shown to give rubber stocks possessing the lowest resistivity and the least change in resistivity during deformation.

10:35 A.M.—20—Cross-Linking in Natural Rubber Vulcanizates. ***H. E. Adams and B. L. Johnson (Chemical and Physical Research Laboratories, Firestone Tire & Rubber Co., Akron, Ohio). (Paper will be presented by Mr. Adams).***

The cross-linking of natural rubber vulcanizates containing varying proportions of the typical compounding ingredients has been determined. Comparison of this cross-linking data with the amount of combined sulfur and zinc sulfide produced in the various vulcanizates reveal the following relationships:

For a definite sulfur concentration, the cross-linking (in the absence of degradation) is directly proportional to the amount of soluble zinc present in the vulcanizate. The amount of zinc sulfide produced is a measure of the degradation reactions, since a mole of zinc sulfide is produced for each mole of cross-linking destroyed. Thus, the original amount of cross-linking produced is equal to the sum of the amount of zinc sulfide formed and the experimentally determined cross-linking.

At high levels of soluble zinc, a maximum amount of cross-linking is obtained from a definite level of sulfur which corresponds to two sulfur atoms per cross-link. At lower zinc levels, the ultimate ratio of combined sulfur to cross-linking is much larger than two. Thus, it is possible by the proper choice of sulfur and soluble zinc concentrations to eventually utilize all of the sulfur in cross-linking. The over-all stoicheometry of the cross-linking reaction is one zinc atom and two sulfur atoms for each cross-link formed.

11:00 A.M.—21—Chemical Analysis of GR-S by Complete-Solution Procedures. ***Frederic J. Linnig, Jean M. Peterson, Demby M. Edwards, and Walter L. Acherman (National Bureau of Standards, Washington, D. C.). (Paper will be presented by Mr. Linnig).***

A scheme is presented for the analysis of the gross chemical constituents of uncompounded GR-S synthetic rubber. A 5-g sample is dissolved in a 5:1 mixture of toluene and ethanol and made up to a final volume of 250 ml. The stabilizer content of the samples is determined by means of a spectrophotometric procedure on a 3-ml aliquot of this solution diluted to 100 ml with methylcyclohexane. Organic acid is determined on a 100-ml aliquot by titration with 0.1*N* alcoholic NaOH following dilution with 70 ml of solvent. The remaining 147 ml of the original solution is diluted with 100 ml of solvent and titrated for soap with 0.05*N* alcoholic HCl. The color changes of meta cresol purple are used to determine the end-points in both titrations. The bound styrene content of the polymer is determined by measurement of the refractive index of a piece of rubber purified by precipitation from the titrated soap aliquot with an 85:15 mixture of isopropanol and water. With the aid of corrections for ash and moisture, a complete analysis of the gross polymer and non-polymer constituents of the sample may be made.

11:20 A.M.—Business Meeting.

Friday Afternoon—October 31

2:00 P.M.—22—A Quantitative Study of the Reaction of Ozone with GR-S Rubber and Various Antioxidants. ***E. R. Erickson, R. A. Berntsen, and E. L. Hill (Augustana Research Foundation, Rock Island, Ill.). (Paper will be presented by Mr. Erickson).***

There are many ways of analyzing the results of the action of ozone on rubber, but none of these give the quantitative amounts of ozone that will attack a given sample. A method is proposed and an apparatus has been built for the quantitative determination of the ozone absorption by a weighed substance.

The sample is deposited by the principle of chromatography on a column of silica gel. Ozonized air of a known concentration (25 to 2500 ozone pphm) is passed through the sample on the column and the residual ozone in the air stream is continuously titrated with sodium thiosulfate until the ozone concentration has returned to the initial value. A blank determination is first made to determine the initial rate of flow of ozone in the air stream in the apparatus.

Using this method, determinations were made of the quantity of ozone reacting with samples of various unvulcanized GR-S rubbers. It appears that the carbon-carbon double bonds in the hydrocarbon chains take up one mole of ozone per double bond. The benzene rings are not attacked. The reactions of ozone with various compounds, which can be milled into rubber to act as antioxidants, are reported.

2:20 P.M.—23—The Permeability of Different Elastomers to Gases Using Carbon-14. ***A. D. Kirshenbaum (Research Institute, Temple University, Philadelphia, Penna.) and W. B. Dunlap, Jr. (Lee Rubber & Tire Corp., Conshohocken, Penna.). (Paper will be presented by Mr. Kirshenbaum).***

It is well known that rubber membranes are permeable to gases and that the rate of permeation is specific for a given gas and rubber. The permeability of gases through rubber is due to the dissolving of the gas molecules into one side of the rubber membrane followed by diffusion of the gas through the membrane and evaporation of the gas on the other side.

The permeability of Butyl, GR-S, natural and a low styrene GR-S type rubber to air and carbon-14 labeled carbon dioxide

was determined. The procedure and apparatus used will be described. The rate of permeability employing radioactivity labeled gases was determined in 3 to 5 hours at 50° to 75° C. and about 16 hours at 27° C. Using this radioactive technique, it was found that the differences in permeability of the various elastomers to a given gas are due mainly to the differences in the rate of diffusion and only slightly to the differences in solubility and rates of evaporation.

The effects of pressure, temperature, elongation, water and density were studied. It was found that pressure, temperature and elongation all had a linear effect on the permeability with temperature and elongation having a much greater effect than pressure. The permeability of gases increased with increase in density and decreased with increase in water content.

2:40 P.M.—24—Study of Mercaptobenzothiazole Vulcanization Using Sulfur-35. *I. Auerbach (Goodyear Tire & Rubber Co., Akron, Ohio).*

A study has been made to determine the function of mercaptobenzothiazole (MBT) in the vulcanization process. Radioactive sulfur-35 and MBT tagged with sulfur-35 were used for measuring the sulfur and MBT reaction rates.

The effect of fivefold variations in the zinc oxide, sulfur and MBT concentrations on the sulfur combining rate was measured. The rate was found to be dependent on the initial sulfur and MBT concentrations and independent of the zinc oxide concentration within the concentration ranges studied. The ratio of combined sulfur to reacted MBT is constant during the course of the reaction as long as both reactants are present.

When the vulcanization reaction is attempted in a saturated medium such as polyisobutylene the final product is the zinc mercaptide of MBT. This reaction is very rapid and takes place within the first minute of heating at 140° C. The zinc mercaptide is not found when GR-S is used except at very low sulfur concentrations.

It was found that the zinc mercaptide reacts with sulfur in an unsaturated medium to regenerate MBT. The reaction was studied in GR-S, decene and isododecylene. Since the hydrogen which is involved in the regeneration of the MBT comes from the hydrocarbon, it is suggested that the hydrocarbon in its activated form then reacts with sulfur.

The experimental results which indicate that the MBT zinc mercaptide is an intermediate in the vulcanization process were substantiated when the mercaptide was substituted for MBT and the same sulfur combining rate was obtained. Further evidence is found in kinetic equations which account for the data.

3:05 P.M.—25—Discussion of the Triangular Phase Diagram for Copolymer Solvent Systems. *F. W. Boggs (General Laboratories, U. S. Rubber Co., Passaic, N. J.).*

The evaluation of any solvent-resistant rubber must be based, at least in part, on a measurement of the amount of swelling which it undergoes when in contact with a solvent which it should resist. In the absence of any theoretical knowledge, it is necessary to test a large number of polymers and copolymers before a promising system can be chosen for detailed study. This situation can be greatly improved by some simple theoretical considerations.

It is shown in this paper that the study of the swelling of copolymers can be advanced by constructing a triangular phase diagram of the type frequently used in three component phase studies. The effect of different solvents and copolymers on the phase boundaries in the diagram are discussed. Particular emphasis is given to the influence of the cohesive energy density and to the degree of cross linking.

In one particular case, chosen for its practical importance and ease of calculation, the phase diagram is calculated theoretically using the methods developed by the author [*J. Chem. Phys.*, Vol. 20, p. 632 (1952)] for the calculation of the chemical potential of solvents in polymer systems. The results are shown to be in good agreement with those obtained for the butadiene-acrylonitrile system.

3:25 P.M.—26—Second Order Transition Temperature of Butadiene Copolymers. *R. H. Gerke (General Laboratories, U. S. Rubber Co., Passaic, N. J.).*

Second order transition temperature of copolymers of butadiene and the following monomers—acrylonitrile, styrene, and methyl acrylate—have been determined using the dilatometer method. Mercury or 38% sulfuric acid were used as confining fluids. It has been found that the logarithm of the second order temperature in deg. K. is a linear function of the weight fraction of monomer. A thermodynamic discussion of second order transition temperatures is given. Second order transition temperatures from dimensional measurements are about 3° C. higher than those from published heat capacity data.

Geon Plastisol Compounds for Cold-Dipping Applications

COLD-dipping, non-dripping plastisol compounds developed at the Avon Lake Laboratory of the B. F. Goodrich Chemical Co. are reported to have many advantages over conventional types of dipping plastisols.

The general technique for using the conventional dipping compound is to pre-heat the object to be dipped; this causes the plastisol to gel more quickly, allowing a thicker, sag-free build-up. However, this pre-heat causes an increase in viscosity of the plastisol contained in the tank over a period of time because of the continual build-up of heat in the plastisol. Contamination can also result because of the gelled particles brought about by the steady flow of pre-heated objects through the plastisol, causing an irregular surface to be formed on the immersed articles. Another disadvantage in using the pre-heat system with conventional plastisols is that thin objects cannot hold enough heat to allow a good build-up of plastisol on them.

Special compounds had to be prepared for cold dipping. If ordinary plastisol formulations are used, the dipped objects "sag" and drip freely during curing because of the lowered viscosity caused by the heat. This sagging is eliminated in the new compounds by obtaining proper balance between the viscosity at low shear rates and the yield point. This combination of flow properties can be compared to those exhibited by common ketchup and mustard, which flows freely after their initial resistance or yield point is overcome.

The mixing techniques are the same as those used in preparing ordinary plastisols with the exception that the gelling agent, aluminum stearate in this case, is best introduced by dissolving it completely in 115° C. plasticizer and then allowing it to cool prior to compound preparation.

Following are suggested formulations for the preparation of non-tear forming, cold-dipping plastisols:

CLEAR	
Geon 121	100.0
TOF (trioctyl phosphate)	26.0
Monoplex S 71	14.0
GP 233	14.7
Advance S 52	3.0
Aluminum stearate	2.3
Total	160.0

WHITE	
Geon 121	100.0
GP 233	47.5
DOS (dioctyl sebacate)	47.5
Aluminum stearate	1.4
TiO_2 (titanium dioxide)	5.0
Dyphos	3.0
Supermultifex	20.0
Total	224.4

Editorials . . . . . .

Buffer Stocks

ONE of the suggestions advanced at the recent meeting in London of the "working party" of the International Rubber Study Group for price stabilization of natural rubber was the establishment of a buffer stock. It has since been learned that serious consideration for setting up such a buffer stock is being given in responsible quarters and the subject will be the major discussion at the next scheduled meeting of the "working party."

Some interesting comments regarding a buffer stock for rubber have been advanced by William T. Phillips, Professor of International Economics at Johns Hopkins University, in the current issue of "Natural Rubber News." Suggesting that the price for synthetic rubber should be used as the fixed base around which natural rubber prices should be stabilized, Dr. Phillips states that an international buffer stock mechanism could be set up, with adequate financing, ready to buy when and if the price of natural rubber reached a point about 15% below the base synthetic price.

The percentage used above is illustrative only, and in picking the proper percentage Dr. Phillips indicates that consideration should be given to the price differential, on an equal quality basis, if there is one, between synthetic and natural rubber. The percentage should be set far enough below the base price to take account of any differential and should also be at the theoretical point which under unrestricted use and private ownership would induce fabricators to shift in volume from synthetic to natural rubber. This, he suggests, should be the buffer stock buying price.

According to Dr. Phillips, the top of the range, or selling price, similarly should reflect the point at which, under private unrestricted production and use, fabricators would shift in volume from natural to synthetic. In the event that the top of the range was reached before stocks had been accumulated, the U. S. Government should increase synthetic rubber output rapidly, recomputing costs to reflect higher output, which in turn would change the range prices. In the event that buffer stocks had been accumulated but were dwindling rapidly, synthetic production could again be stepped up, costs recomputed, and, if necessary, the range prices altered. This kind of action, says Dr. Phillips, should take place when the buffer stock had sold off some 75% of its natural rubber stocks.

It is Dr. Phillip's studied opinion that an arrangement of the type outlined would achieve four major effects, as follows: (1) It would keep natural rubber prices within a competitive range with synthetic rubber; (2) It might work out that the buffer stock was largely a standby operation since, if natural rubber prices approached the bottom of the range, speculators knowing it would not fall lower would begin to buy; in turn there would be an incentive to sell just prior to the maximum price levels; (3) Increasing and decreasing, to the security minimum, American synthetic production would provide a safety valve which would make it easier for the buffer stock to meet consumer requirements in times of sudden demand, and (4) Both producers and consumers would know, within a fairly narrow range, what the cost of their raw materials would be for extended periods of time.

Being a student of rubber economics, and familiar with the vagaries of the industry, Dr. Phillips is well aware of the fact that a buffer stock operation of this nature would become considerably more difficult if and when the U. S. synthetic plants were turned over to private industry. It would mean that the price changes would be far more frequent and that the range spread between maximum and minimum prices would in all probability have to be widened, since the maximum would have to be high enough to induce private expansion of synthetic production and vice versa. He maintains, however, that the plan would still be feasible and would prevent the devastating results of sudden, sharp price changes on the natural rubber producing areas while permitting competition between the two materials.

It is quite possible that a buffer stock arrangement would prove of long range benefit to both producers and consumers of rubber, particularly since the latter are very much interested in any plan which results in price stabilization, providing such price is within reasonable limits. This brings to the fore the 50-year-old question of what is a reasonable price for natural rubber. The major flaw in Dr. Phillips' plan is its operation after the domestic synthetic rubber plants are in private hands, and despite the use of his phrase "if and when" the chances are quite strong that it will be a reality before the end of 1954.

NEWS OF THE MONTH

RFC TO UNDERTAKE ENGINEERING APPRAISAL TO EVALUATE SYNTHETIC RUBBER FACILITIES

THE Reconstruction Finance Corporation has announced that an engineering appraisal of the synthetic rubber facilities now owned by the government will be undertaken as part of the development of a plan for the disposal of the twenty-six plants. Such an appraisal has been recommended by industry representatives who have been holding preliminary discussions with RFC officials on the disposal program. Before the actual appraisal work gets under way, further discussion with industry representatives is anticipated. RFC has stated, however, that engineering firms interested in submitting bids on the project should communicate with Morton E. Yohalem, special deputy for rubber facilities disposal, and to consult with him on the specific scope and method of the appraisal. The plan for the disposal of the government-owned synthetic rubber facilities is due to be submitted to the President by March 1, 1953.

A previous disposal plan, worked out by a special committee of government rubber experts, went from the White House to Congress in early 1950. It proposed sale of the plants to private industry under a complicated formula which would have kept the government's hand in their operation. When the House Armed Services Committee took up study of the matter a month later, most of the industry went on record against the plan.

A special rubber subcommittee went further. Its chairman, Representative Vinson (Dem., Ga.), said he didn't want to see the plants out of government hands on any terms. He gave unsettled world conditions as his reason. The Senate Armed Services Committee opened hearings on the same subject five months later. In the interval the price of natural rubber rose considerably. Until that time the cost of natural had been only a cent or two different from that of synthetic and the use of synthetic had been sharply declining from World War II levels.

The rubber industry advisory group, at this time, urged the complete reactivation of all the synthetic facilities as a means of curbing the natural rubber price. This was accomplished at about the time that Congress passed and the President signed a measure extending the government's powers over the synthetic rubber industry for another two years.

The two-year period was up last June 30, at which time the disposal method was not a major issue. The industry seemed to be more interested in getting the government out of the rubber business. At that time, President Truman came out for outright disposal of the Butyl plants owned by the government and called for another two years of rubber law.

A compromise was worked out so that the law which keeps ownership of the synthetic plants in the government's hands was extended 18 months. That time limit runs out on March 31, 1954.

Meanwhile, the price of natural rubber has come down considerably. Industry, while taking part in disposal discussions with RFC, isn't showing any evident interest in buying the facilities, according to trade reports. One spokesman explained that everything about future disposal is tied to the price question.

Areas of Competition

Meanwhile, the Goodyear Tire & Rubber Co. has come up with an interesting breakdown showing the areas in which natural rubber and GR-S are preferred and the area in which price is the determining use factor. As reported in the October, 1952, issue of the *Natural Rubber News*, published by the Natural Rubber Bureau, Washington, D. C., natural rubber is preferred for applications totaling 35% of the present consumption trends. These products include such items as truck and airplane tires, foam latex, sheeting, drug sundries, rubber bands and belting carcass.

GR-S, according to the breakdown, is preferred for applications totaling 30% of consumption, for such products as passenger and small truck tire treads, flooring, wire and cable, shoe soles, tank lining, passenger and small truck tire camelback, molded and extruded goods, wringer rolls, industrial rolls and certain types of tire hose.

Between the natural and GR-S preferred zones falls a "twi-light" or "cloudy" zone in which price is the controlling factor if supplies are adequate to permit free choice. This "middle" zone accounts for 35% of consumption and includes such applications as passenger tire carcasses, tractor tires, implement tires, truck camelback over 7.50, inner tubes (Butyl vs. natural), belting covers, hose, and other products.

In commenting on the Goodyear breakdown, the Natural Rubber Bureau states that while the chart is a fair opinion based on current outlook, a marked change in price relationships between natural and synthetic or a new development in natural rubber preparation or compounding could very quickly alter the perference percentages. Other factors which might affect the percentages include government regulation and consumption trends.

Outlook for Rubber Accord

A prominent Dutch rubber expert said recently that there is still a good chance for the scheduled January, 1953, meeting of the "working party" of the Rubber Study Group in London to arrive at a preliminary agreement on methods for maintaining market and price structures for natural rubber. He strongly denied reports made after the group's July-August meeting that the conference had been a failure.

At that meeting, two proposals were submitted, including an Indonesian plan for a multilateral agreement combined with a buffer stock, and a Malayan suggestion for a buffer stock alone. It was emphasized that the proposals were thoroughly and sympathetically discussed by the producers and consumers and particularly by the American delegates who put forward a number of constructive questions regarding the implications of the proposals.

On the basis of these questions, plans are now being further studied while attempts are being made to compromise the Indonesian and Malayan proposals. It is hoped that more detailed proposals based on the Malayan suggestions will be laid before the January conference.

It was said that what producers want is a fair, equitable and stable price, with the Americans giving the impression that they are not unsympathetic to this aim, especially as the Far Eastern situation is at present very serious. The Indonesian rubber outlook was pictured as gloomy, because no replanting is taking place and smallholders are beginning to neglect their properties.

Reports from Ceylon, meanwhile, state that the sale of the entire Ceylonese rubber crop to Communist China is being contemplated in return for sorely-needed rice. Ceylon has been shipping rubber to Communist China with the trade handled through private channels which have con-

nections with Polish shipping interests. China will accept the rubber only if it arrives on vessels of Soviet bloc nations.

There has been some complaint by Ceylon producers that prices received for rubber going to Communist China are too low. The United States has taken a dim view of Ceylon's action in selling rubber to the Communists. The U. S. is shipping 40,000 tons of rice to Ceylon this year, but the Ceylonese government apparently feels that this is not sufficient to meet its needs. Ceylon's rubber production in 1950 amounted to 113,500 tons.

Oil and Oil-Black Masterbatches

RFC has reported that in accordance with the objective of its Memorandum of July 25, 1952, i.e., the establishment of the interchangeability of various oils at different levels, a number of consumers have requested an opportunity to evaluate oils other than Circosol 2XH at the 50 part level. To date, RFC said, all requests have been for such a polymer using one of the highest aromatic oils of the group.

Accordingly, a pilot plant run of a polymer similar to X-709, but which incorporates 50 parts of Dutrex 20 and/or Califlux TT, will be made if sufficient requests for such a polymer or polymers are received immediately. Such requests, RFC advises, should be for minimum quantities required for evaluation since this will be a pilot plant run in the interest of expediting availability of such a polymer. RFC desires to make such evaluations fit into the program of establishing interchangeability of oils at different levels and the development of more suitable oil and oil-black masterbatch polymers by January 1, 1953.

All oil-masterbatch polymers are currently produced to a definite range of finished polymer Mooney viscosity. The mean Mooney target for this proposed run will be 55 ML-4 for the finished polymer. In making requests, consumers are urged to indicate whether Dutrex 20 or Califlux TT is satisfactory for the run. RFC urges that consumers request some of each so that the interchangeability at the 50 part level may be determined.

Recent NPA Activities

The National Production Authority has announced the abolishment of the Office of Civilian Requirements. Its functions and staff have been transferred to the new Office of Distribution, Department of Commerce, and a new Civilian Requirements Division in the NPA Policy Coordination Bureau. Walter J. Currie has resigned as NPA assistant administrator to assist Horace B. McCoy in the organization of the Office of Distribution. Leslie P. Doidge will act as director of the new Civilian Requirements Division.

The new division will be responsible for defense production activities related to civilian requirements for consumer products and civilian production programs. The division will be concerned with maintaining an adequate supply of essential civilian products, services and facilities so that the highest productive efficiency of the civilian population may be obtained in support of the defense program.

NPA, in an amendment to Regulation 1, effective September 9, also acted to remove inventory controls from a number of commodities, including selected chemicals. Materials removed from inventory controls include polyethylene, polyethylene resins and sulfuric acid.

The Wire and Cable Industry Advisory Committee has placed a series of important recommendations before NPA urging the following: (1) That the government publicize the fact that copper still is in short supply, not plentiful as popularly believed; (2) That the government's policy of adding copper to its stockpile be deferred until such time as the industry catches up with its back order load; (3) That entitlements to purchase foreign copper be accorded the same validity as allocations issued for domestic copper and for guaranteed delivery of copper under foreign entitlements; (4) That NPA make a thorough survey of the entire copper supply and demand situation; (5) That unused entitlements for foreign copper should be mandatorily voted by the tenth of each month; (6) That no changes be made in the present method of copper allocations, except that every certificate placed be made good and that NPA look into inventory positions as well as order boards; (7) That relative inventory positions be considered when NPA decides the monthly split-up of copper allocations between the brass mills and wire mills; (8) That the committee's task group, formed to draft a plan for ultimate removal of CMP copper controls, re-study developments since their first report was made and have a new report ready for the committee's next meeting on November 13.

Recent OPS Activities

On August 20, OPS announced supplemental standards for the suspension of price controls on manufactured goods selling well below ceilings and revised standards for the decontrol of items unimportant to the cost of living or the continued control of which is not feasible. An amendment to GOR 5, Revision 1, has suspended price ceilings on mattresses, including rubber mattresses, under the new supplemental standards.

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Russian Synthetic Plan

Under the terms of its latest five-year plan, the Soviet Union intends to increase its production of synthetic rubber by 82% over 1950 production. Since actual production figures covering Sovprene have never been released by the Soviet Union, no actual comparisons can be drawn from the percentage figure. The production of some other products under the new plan would be increased as follows: cast iron, 76%; steel, 62%; oil 85%; electricity, 88%, and footwear, 55%.

In GCPR, SR 118, dated September 10, OPS established ceiling prices for manufacturers and brand owners of second line low pressure tires. Price ceilings have been established at 75% of first line prices.

OPS has also simplified requirements for reporting ceilings on certain new chemical specialties. In Amendment 55 to CPR 22, September 15, 1952, OPS simplified reporting procedures on household cements, adhesives, and chemicals used in treating and processing rubber.

Recent DPA Activities

The Defense Production Administration has announced allotments of structural steel for the third and fourth quarter of 1952 and for the first quarter of 1953. The rubber industry, in the third quarter of this year, will receive 150 tons of structural steel and 110 tons in the fourth quarter. It will not receive any structural steel in the first quarter of 1953, according to the DPA announcement.

Firestone Sets Safety Record

What is said to be a new world record for industrial safety—5,300,000 accident-free hours—has been set for the tire manufacturing industry by the Akron plants of the Firestone Tire & Rubber Co., J. E. Trainer, vice-president in charge of production announced recently. In establishing the new world record, the Firestone Akron plants have surpassed their previous record by 1,500,000 hours set in 1948. The world record just broken was made last year by the Memphis tire plant of Firestone when it completed 4,397,000 hours of accident-free work. The Firestone Des Moines plant held the world record of 3,528,900 hours before Memphis. The safety record of Firestone employees in all plants throughout the world is the best in the industry and has earned for the company the Distinguished Service to Safety Award of the National Safety Council in six of the last seven years.

Makes Old Style Tire for Tour

The same type tires that were used in early day Glidden Tours and cross-country speed dashes were on the wheels of most of the 200 antique automobiles participating in the 1952 Glidden Tour Revival honoring the 50th anniversary of the American Automobile Association on September 23 and 24 in Washington, D. C. Firestone Tire & Rubber Co., cognizant of the deep interest in antique automobiles, began the manufacture of old-style tires after World War II to keep these museum pieces on the road. Firestone service trucks, which accompanied the original Glidden Tours and the postwar revival tours, escorted the vehicles in this latest tour. A limited number of these tires are being manufactured by Firestone each year for antique automobile fanciers.

What is said to be the largest piece of flexible tubing ever made has been fabricated of neoprene impregnated duck supported by spring wire by the Flexible Tubing Corp., Guilford, Conn., for the Air Conditioning Division of the General Electric Co.

U. S. COURT DECREE RESTRICTS DUPONT AND ICI RELATIONSHIP

As the result of a decree handed down by Judge Sylvester J. Ryan of the U. S. District Court for the Southern District of New York within recent weeks, virtually all existing agreements between E. I. du Pont de Nemours & Co. and Imperial Chemical Industries, Ltd., will be terminated. Further, licensing of nylon and polyethylene patents on a reasonable royalty and non-exclusive basis becomes compulsory.

The decree is the final result of an eight-year anti-trust suit brought against the two companies by the U. S. Government. Early in 1951 Judge Ryan found the defendants guilty of conspiring to violate the Sherman Anti-Trust Act by unlawful agreements to divide world territories and by allocating customers and markets. Subsequently, he set forth an "opinion on remedies" outlining some of the steps he intended to take to "prevent and restrain the defendants from violating the law" and to "re-establish competitive conditions with respect to U. S. imports and exports." These "remedies" are incorporated in the decree now handed down.

Compulsory Licensing

The patents and technology which are subject to compulsory licensing on a non-exclusive, reasonable royalty basis, under the terms of the decree, are those which were in existence as of June 30, 1950. A government request for compulsory royalty-free licenses was denied by the court on the grounds that it would destroy the value of the patents involved.

With respect to polyethylene, the decree cancels the existing agreement between DuPont and ICI under which DuPont was the sole licensee in the United States, but provides that DuPont can continue production and sale on a non-exclusive license basis providing payment of royalties with no contractural barriers to exportation. Polyethylene was developed in England by ICI which subsequently granted an exclusive license to DuPont. Shortly after securing the license, DuPont sub-licensed Union Carbide & Chemical Corp. The sub-license covers only the basic patents and not process or improvement patents.

In view of the fact that there is no current agreement between DuPont and ICI on neoprene, that material was not affected by the court's decree. It was pointed out, however, that such an agreement was in existence from January, 1941, to May, 1946, but DuPont's U. S. patents were not included in the license granted to ICI and the British firm did not exercise the right to manufacture neoprene during the life of the agreement. DuPont has been selling fairly large amounts of neoprene throughout the British Empire through its own sales agents, and accordingly the court's decree did not require compulsory licensing of neoprene patents.

In June, 1948, DuPont and ICI formed a new agreement which provides that all DuPont's British patents and all ICI's U. S. patents would be licensed to the two concerns involved on a non-exclusive basis. The court let this agreement stand on the condition that it not be modified without the court's permission. The two companies, however, are prohibited from negotiating any licenses or assignments under existing or future patents or technology for a period of five years. The decree gives the court jurisdiction over the defendants for a like period of time.

Also under the terms of the decree, DuPont and ICI must discontinue their joint interests in several companies, including Canadian Industries Limited (CIL). Originally, DuPont and ICI organized CIL to serve principally as a selling agent for their products and not as a manufacturing concern. CIL, however, has become a major producer of chemicals and related products in Canada, and is one of the largest chemical factors in that country. Neoprene sales in Canada are handled by the company.

The court felt that a physical division of the separate manufacturing ventures of CIL is feasible and so decreed. As an alternative, DuPont will be permitted to acquire ICI's stock interest in CIL or vice versa. The new owner will not be allowed to distribute the products of the other and price fixing on the resale of common products is prohibited. The question of a U. S. court's jurisdiction over a Canadian company is currently being attacked (as reported in the Canadian News Section elsewhere in this issue).

DuPont is reported to have won at least one concession with the insertion of a provision in the decree for reciprocal licensing. This means that if DuPont is to give a patent right it can require the applicant to give one or two patent rights in return.

The defendants in the action, as well as the government, can file appeals from Judge Ryan's decree. The appeals must be filed within 60 days from the date of the decree. Such appeals are anticipated.

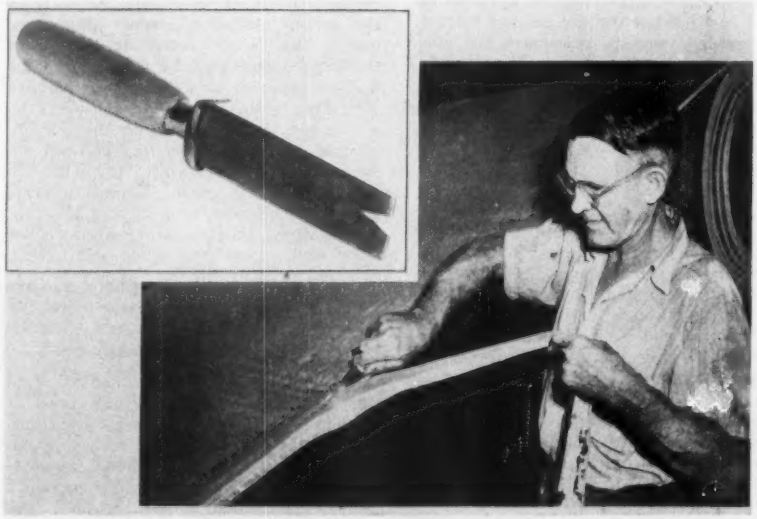
Named Sirvene Division Manager

Robert H. Barbour, technical director of the Sirvene Division of the Chicago Rawhide Manufacturing Co., Chicago, Ill., has been appointed manager of the division. He will continue as technical director of the division. The position of manager of the division was formerly held by J. G. Barbour prior to the passing of Herman M. Koelliker in August of 1951. J. G. Barbour is now a vice-president of the company. H. C. Crosland has been named assistant technical director of the Sirvene Division. In this capacity, he will relieve R. H. Barbour of some of his duties as technical director.

New Hycar Technical Newsletters

B. F. Goodrich Chemical Co., Cleveland, Ohio, has published two more in its series of "Hycar Technical Newsletters." Issue No. 8, dated July 1, 1952, deals with a "Comparison of Properties of Standard Hycar Polymers 1011, 1012, 1013 and 1014." Issue No. 9, dated August 1, 1952, covers "Change of Hardness with Changes in Temperature on Compounded Hycar Polymers." Issue No. 9 is accompanied by Service Bulletin RC-4, dated December, 1951, covering "Good-Rite Resin 50."

METAL GUARD FOR STOCK-TRIMMING KNIVES REDUCES PLANT INJURIES



Safety-minded employees in the belt room at the Goodyear Tire & Rubber Company's Plant 2 in Akron, Ohio, have devised a metal guard for stock-trimming knives that should reduce to a minimum the possibility of injuries from this source. The guard, which is small and easily detachable, fits all the various Hyde-type knives used in cutting and trimming mechanical goods stock. Placed between the knife blade and handle, the safety device gives positive protection to hands and fingers. In the above reproduction, a belt room employee is using a knife equipped with the guard to trim a belt section. A close-up of the guard can be seen at left.

NAUGATUCK SYNTHETIC PLANT CELEBRATES TENTH ANNIVERSARY

In the short space of a decade, chemical research has broken the century-old reign of natural rubber as the single basic raw material of the rubber industry, John P. Coe, vice-president and general manager of the Naugatuck Chemical Division, U. S. Rubber Company, said recently. The occasion was the tenth anniversary of the Naugatuck Synthetic Rubber plant at Naugatuck, Conn., one of the first synthetic rubber plants constructed in the United States. It was ten years ago in September that the Naugatuck plant started production.

Because of the urgent wartime need for synthetic rubber, the plant was designed, built and put into production by the company almost entirely on the basis of laboratory research with brief pilot plant experience. Only 18 months after it was completed, the plant was producing more than 2,500 tons of synthetic rubber a month. It was the first plant in the government's synthetic rubber program to receive the coveted Army-Navy "E" Award and by V-J Day, it was producing rubber at the rate of 42,000 annual tons.

Since the war, the plant has concentrated on the production of new types of synthetic rubber. It produces a superior type of rubber for wire insulation which is in large demand from the wire industry. Much of the initial research and development work in "cold" rubber was accomplished at Naugatuck and Naugatuck scientists led the way in the development of "cold" synthetic rubber latex. About 60 per cent of the plant's current production is latex for use in foam mattresses, brake linings, packing materials, dipped products and tire cord.

Rubber Industry Future

"Today, the future of the rubber industry as we know it lies—not only with natural gum rubber—but with the industry's scientific knowledge and developmental ability in the field of chemically-made rubber and its first cousins, the plastics," Mr. Coe said. "The rubber industry now has hundreds of raw materials that can be tailor-made to fit its exacting requirements. This has been due primarily to the stimulus of chemical research and development which has brought synthetic rubber up from the status of a warborn substitute to a point where it is in large demand on its merit in addition to any considerations of price, availability or national defense. It means the industry must continually broaden its economic and technical thinking to keep pace.

"These chemical products are changing rapidly the rubber industry's methods of purchasing basic raw materials. More and more raw materials are bought from competitive American manufacturers under contract and less and less from the speculative commodity markets. When raw materials are purchased from freely competitive manufacturers, they are less subject to the wide price swings characteristic of commodity exchanges. Rubber, plastics and synthetic rubber, with a common meeting ground in chemistry, are being brought closer and closer together from a technical viewpoint," he said.

"An example of this union can be found in some of the newer types of blends of rubber and plastics called gum plastics. These gum plastics are a whole series of relatively new materials which are rigid, semi-rigid, extremely tough—in fact, almost impossible to shatter—but easily form into products. They combine the toughness of rubber with the hardness and dimensional stability of plastics. The products may be tough, chemically-resistant pipe, battery cases, television parts, typewriter cases, luggage, and dozens more," Mr. Coe said.

KELLY SUCCEEDS GRAHAM AS GOODRICH VICE-PRESIDENT MANUFACTURING

Arthur Kelly

Thornton G. Graham

Arthur Kelly, associated with the B. F. Goodrich Co. since 1925, will become vice-president in charge of manufacturing for the company on January 31, 1953, succeeding Thornton G. Graham, who will retire as of that date. Mr. Kelly joined Goodrich as a chemist shortly after his graduation from Purdue University with a degree of bachelor of science in chemical engineering. He served in the Compounding and Tire Construction Departments of the Tire Division and in the Technical Department of the Processing Division before being transferred to the company's tire plant in Los Angeles. He was in Japan for several years before being recalled to operate new plants established by the company at Oaks, Penna., and Clarksville, Tenn. He returned to Akron as superintendent of Plant 4 in 1941. During World War II, Mr. Kelly superintended the construction and early operations of the Lone Star Ordnance plant, and directed the construction of four government plants for the production of GR-S. Mr. Kelly is now general manager of Industrial and Aeronautical Products Manufacturing.

Mr. Graham has been prominently and actively identified with the rubber industry for more than 38 years following his graduation from Princeton University. He became production superintendent of the Goodrich Tire Division in 1925, division superintendent in 1926 and assistant works manager the following year. In October, 1927, he became works manager and in January, 1928, was elected a vice-president. He has for years been closely associated with many civic projects. He has been a trustee of the City Hospital of Akron since 1929 and is now president of the Board of trustees. His home is in Kent, Ohio, where he has several business interests.

Ask Cleveland Belt Subway

Construction of a belt conveyor passenger subway underneath Euclid Avenue between Public Square and Playhouse Square in Cleveland, Ohio, has been recommended to the city by the chairman of the Cleveland Transit system. The recommendation is similar to a plan drafted for New York City by the Goodyear Tire & Rubber Co. and the Stephens-Adamson Mfg. Co.

Increases Production Capacity

Conveyor belt production capacity at the Buffalo plant of Hewitt-Robins Inc. will be increased 41% by a new $1,000,000 plant scheduled to go into operation late in October. The expansion will make the company one of the world's largest producers of conveyor belts. The company's entire Belt Manufacturing Department is being rearranged to streamline production and to utilize new mechanical handling equipment. A new 12,000 square feet building has been constructed and machinery is now being installed. The new equipment includes a modern press costing $220,000 which will make belts up to 72 inches wide for long-haul conveyors used in the handling of coal, ore and other bulk materials. The widest belt that could be made on old equipment, the company states, was 60 inches. Dedication ceremonies are scheduled at the plant October 25.

An index to Volume 71 of RUBBER AGE will be found on Pages 139 to 142 of this issue.

ASME RUBBER-PLASTICS GROUP HOLDS FALL MEETING IN CHICAGO

The Rubber and Plastics Division of the American Society of Mechanical Engineers held its Fall Meeting at the Hotel Sheraton in Chicago, Ill., on September 8. The meeting was held in conjunction with that of the parent society which, in turn, was held in cooperation with the American Society of Heating and Ventilating Engineers, and represented the participation of those two organizations in the Centennial of Engineering which was held in Chicago from September 3 to 13.

The meeting of the Rubber and Plastics Division featured the presentation of five technical papers, two on rubber and three on plastics. H. A. Winkelmann (Dryden Rubber) acted as chairman for the rubber session, with Paul F. Niessen (Victor Mfg. & Gasket) as vice-chairman. A. G. Susie (Armour Research Foundation) and Paul McGervy (Richardson Co.) performed the same services, respectively, for the plastics session. Approximately 60 members and guests attended the sessions.

Papers at Rubber Session

The first of the rubber papers was on "Stress Relaxation in Compression of Rubber and Synthetic Rubber Vulcanizates Immersed in Oil," by J. R. Beatty and A. E. Juve of the B. F. Goodrich Research Center, Brecksville, Ohio. The paper was delivered by Mr. Beatty who pointed out that although stress relaxation in compressive strain has been studied for compounds of various polymers, many products, such as rubber seals and gaskets, are widely used where swelling agents such as oil are encountered. It was therefore thought advisable to measure the stress relaxation properties of various rubbers to determine their performance under such conditions.

The simple beam tester used for this investigation in conjunction with clamping jigs was described by the speaker. The jigs made it possible to have many tests running concurrently using the tester only for periodic stress checks. The variables of temperature and type of oil were investigated and Mr. Beatty showed results which indicate that continuous stress relaxation is inhibited by the presence of oil and that unconfined swelling measurements predict the degree of inhibition directly. Increasing the temperature increases the rate and magniture of the stress increase due to the action of the oil.

The second rubber paper was presented by E. R. Bartholomew, of the Wright Air Development Center, Dayton, Ohio, and was on "Present and Future Requirements of Rubberlike Materials for a Global Air Force." Mr. Bartholomew divided the approaches to the solution of elastomer problems into three categories; (1) Development of new elastomeric materials; (2) Special compounding of currently available polymers, and (3) Design of components either to eliminate the need for elastomeric materials or to make use of those currently available.

The speaker described the desirable characteristics of aircraft tire compounds, including low internal heat generation during flexing, low temperature flexibility, abrasion resistance, and ability to be fabricated from synthetic elastomers. He showed data on the swell of nine typical vulcanizates after 70 hours at 212°F. in diisooctyl adipate. He also showed some formulas for high temperature compounds for use in jet engine oils, and discussed their physical properties.

(EDITOR'S NOTE: Mr. Bartholomew's paper is reproduced in full elsewhere in this issue).

Three Papers on Plastics

At the plastics session, E. F. Borro, of Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y., discussed "Closed Mold Molding Techniques." He outlined a series of extensive tests made by Durez to determine what shape and size runners should be used in pot-type transfer and plunger molding of thermosetting materials, using a number of excellent slides to indicate how holders can secure best results.

A paper on "Mechanical Properties of Glass-Cloth Plastic Laminates as Related to Duration of Stress and Construction of Laminate," prepared by Fred Werren, of the Forest Products Laboratory, Madison, Wisconsin, was given by Charles B. Norris, of the same organization, in Mr. Werren's absence. This paper indicated that methods are available for predicting the directional properties of glass-cloth plastic laminates from a knowledge of the properties associated with their natural axes. Methods for calculating the mechanical properties of cross-laminated or composite laminates were also outlined.

Tensile tests of glass-cloth plastic laminates which showed that modulus of elasticity and proportional-limit stress may be changed considerably after the first application of stress were described and discussed by Alan D. Freas, also associated with the Forest Products Laboratory, in a paper on "Effect of Preloading and Fatigue on Mechanical Properties of Glass-Cloth Plastic Laminates." The data presented indicated that a small number of preloads, in either tension or compression, have no appreciable effect on the strength of the laminate.

Meeting of Executive Committee

A meeting of the Executive Committee of the Division was held during the Chicago sessions. It was decided that the Division would hold three sessions at the Spring Meeting to be held in Columbus, Ohio, next April, one of which will be a special Symposium on Rubber. Fred Wehmer, of the Adhesives and Coating Department of the Minnesota Mining and Manufacturing Co., St. Paul, Minn., was elected a member of the Executive Committee.

Establishes Science Fellowship

U. S. Rubber Co. has established a five-year graduate fellowship in science at the University of Notre Dame at South Bend, Indiana, according to a recent announcement. The fellowship will be selected by the university in accordance with its established practices. The company recently announced the renewal of a five-year program of financial aid to science students in 11 other leading universities.

G-E ZAHN VISCOMETER USED AT AMERICAN ANODE IN DIPPING CONTROL

A technician for the American Anode Division of the B. F. Goodrich Co. is shown here using a General Electric Zahn Viscometer to measure the viscosity of a batch of special latex solution prior to dipping. American Anode produces such diversified rubber products as baby-doll skins (above), surgeons' rubber gloves, blood-pressure bags and bulbs, and nose clips for swimmers. Viscosity control of the latex solution enables American Anode to get the best dip proportions within a narrow range and to check the quality of the fluid.

PCFA DEVELOPS TEST STANDARDS FOR VINYL COATINGS AND SHEETING

Standard test methods for determining the various properties of pyroxylin and vinyl coated fabrics and vinyl sheeting have been developed by the Plastic Coatings and Film Association. The tests are designed to assist purchasers of these plastic materials in determining whether merchandise has the qualities for their particular requirements or meets specifications they have set up.

The organization's Technical Committee, of which C. A. Alt (DuPont) is chairman, worked out these methods for testing physical properties of pyroxylin and vinyl coated fabrics and vinyl sheeting in response to demands from manufacturers, jobbers and major retailers. The procedures and equipment necessary for the tests were kept as simple and inexpensive as possible, within a practical range of accuracy, so that as many purchasers of the industry's products as possible will find it worthwhile and practical to equip themselves to carry out the tests, PCFA said.

For pyroxylin and vinyl coated fabrics, the Technical Committee has developed tests for tensile strength, tear strength, adhesion of coating, weight of coating and fabric, cold crack, blocking, stability to heat and light, abrasion resistance, permeability to water, fastness to rubbing, flame resistance, and volatility.

The tests for vinyl sheeting cover tensile strength, elongation, tear strength, volatility, stability to heat and light, low temperature impact resistance, fastness to rubbing, blocking, flame resistance, resistance to lacquer or varnish lifting and determination of thickness.

PCFA plans to issue within the next few months a booklet describing these standard test methods and necessary equipment. The tests have been formally approved by all members of the association who represent a substantial majority of the nation's producers of pyroxylin and vinyl coated fabrics and vinyl sheeting.

Other than Mr. Alt, the Technical Committee consists of George Laaf (Bolta Products), Martin Bachner (Firestone Plastics), R. S. Price (Goodrich), I. J. Schmitt (Masland Duraleather), DeForest Lott (Textileather), and W. J. Mulvey (U. S. Rubber). Ex-officio members of the committee include R. B. Mitchell (Athol Mfg.), George Bristol (Federal Leather), J. R. Geenty (Goodall-Sanford), Hubert Beck (Joanna Western Mills), C. J. Chaban (Landers), H. A. Russell (Pantasote), and J. E. Manion (Respro).

Postpone International Conference

According to the original plans of the Institution of the Rubber Industry, the International Rubber Technology Conference was to be held in London, England, every five years. The first conference was held in 1938 but, due to World War II, the second one was not held until 1948. The third conference was tentatively scheduled to be held in 1953, but in view of the coronation it has been decided not to hold it next year. There is a possibility, however, that it may be held in the spring of 1954.

CALCO CHEMICAL DIVISION ANNOUNCES PROMOTION OF LOOSLI AND WELLMAN

Alden R. Loosli

Dr. V. E. Wellman

American Cyanamid Co. has announced two executive promotions within its Calco Chemical Division. Alden R. Loosli, formerly assistant manager of the Intermediate and Rubber Chemicals Department of the division, has been named assistant to the division general manager. Dr. V. E. Wellman, formerly director of process engineering for the division, has been named to succeed Mr. Loosli as assistant manager of the Intermediate and Rubber Chemicals Department of the division.

Mr. Loosli attended the University of Idaho and the University of Chicago where he obtained his B. S. degree in physical sciences. He came to Calco in 1937 as a student trainee and subsequently held supervisory positions in the various production departments of the Chemical and Intermediate Division. He was appointed assistant sales manager of the Rubber Chemicals Department in 1947 and in 1950 was named assistant manager of the Intermediate and Rubber Chemicals Department. He is a graduate of the Advanced Management Program of the Harvard School of Business Administration.

Dr. Wellman obtained his A. B. from Phillips University in 1914 and his M. S. in 1927 from the University of Washington from which he also received his Ph. D. in 1929. He was associated with the B. F. Goodrich Co. for 15 years first as a research chemist and subsequently as director of purchases for the Chemicals Division. He was also associated with the R. W. Greef Co. as assistant sales manager of the Solvents Department. Dr. Wellman joined Calco in 1945 and since 1951 had been director of process engineering.

Brazil May Produce Synthetic

A message recently presented to the Brazilian Congress calls for the establishment of a synthetic rubber plant in the Sao Paulo area, according to a recent edition of the Rio de Janeiro newspaper, *Ultima Hora*. The message also called for the establishment of a joint government and private company, "Hevea Brasileira, S.A.," to push natural rubber production. It is hoped by these measures that Brazil may become independent of imports from Singapore, at present reported to amount to 30% of total consumption. Production of synthetic rubber to supplement natural rubber supplies has been under consideration for some time, the National Confederation of Industry disclosed. In Brazil, under existing conditions, the raw material most likely to be selected for synthesis of rubber based on butadiene would be alcohol, the Confederation stated. Brazil has a well-developed alcohol industry, and the product is obtained at a relatively low price, it added.

Goodrich High Flotation Tire

A new off-the-road high flotation tire that is said to provide positive traction in sand or loamy soil has been announced by the B. F. Goodrich Co., Akron, Ohio. The new tire is the 65-inch, 18-ply rating all-nylon wide base earthmover. The tire has been under test for the past two years. Goodrich worked with R. G. Le Tourneau Co., Inc., in developing and testing the tire. The new high flotation tire is rounded to produce better flotation. In sand, it operates at relatively low air pressures of 20 to 25 pounds. Use of nylon in the cord body of the tire enables it to withstand flexing better than other cord materials, Goodrich states. Tapered bead seats prevent slippage on the rim at low pressures. Goodrich engineers point out that in certain materials, especially sand, aggressive tread designs have a tendency to dig in and become bogged down. Shallow-type treads such as those designed into the new tire will not dig in and the equipment keeps rolling because of the high flotation.

Named Technical Service Manager

Harry L. Collyer

Godfrey L. Cabot, Inc., Boston, Mass., has announced two major changes in the executive branch of its Technical Department. Harry L. Collyer, formerly technical manager at Cabot Carbon, Ltd., English subsidiary company, has returned to Boston headquarters to become manager of technical service under Fred H. Amon, technical director of the Cabot companies. Fred W. Barlow, formerly in charge of rubber and plastics testing at the rubber laboratory in Boston, and more recently of the Research and Development Laboratories in Texas, has been appointed to succeed Mr. Collyer as technical manager of the English company. As manager of technical service for the parent company, Mr. Collyer will be concerned with the maintenance of quality control at all Cabot plants and with service to all customers on technical problems. He will be directly responsible for the publication of Cabot technical literature. As technical manager of Cabot Carbon Ltd., Ellesmere Port, near Liverpool, England, Mr. Barlow will be responsible for the continuance of rigid product quality control through constant, complete laboratory testing. He will be in charge of sales technical service in England.

Ultra-Low Pressure Tire

General Tire and Rubber Co. has announced the development of a new ultra-low pressure automobile tire. Named the "Jumbo 14," the tire carries only 14 pounds of air, compared to the standard low-pressure tire with 24 pounds of air. The Jumbo 14 was specifically designed for Fords and Chevrolets. The new tire, engineered for greater safety, is constructed like a building—wider at the base, and tapering down to the narrow conventional tread. The Jumbo 14 has been driven into high curbs and deep chuck-holes at 70 miles an hour without bruising or breaking. The ultra-low pressure feature of this completely new tire gives additional blow-out and puncture protection, the company states.

URW Holds Annual Convention

The United Rubber Workers, CIO, held their 17th annual convention at Asbury Park, N. J., the week of September 15. L. S. Buckmaster was re-elected to his eighth term as president, while Joseph Childs was elected to his fourth term as vice-president. Desmond Walker was elected to his fourth term as secretary-treasurer. A proposed amendment which would have given union executives a two-year term was defeated at the convention. Delegates approved nearly a dozen constitutional amendments, most of which were of a minor nature.

The URW did adopt a "live up to the contract" pledge as a new preamble to its constitution. The measure was aimed at limiting unauthorized work stoppages. The delegates also approved resolutions calling for a new federal rent control law, increased social security payments, federal aid to education, uniform workmen's compensation, stronger industrial health and safety regulations, and enactment of anti-lynching and anti-poll tax legislation. The delegates also endorsed the candidacy of Adlai E. Stevenson, and called for the repeal of the Taft-Hartley Act.

Delegates also approved a resolution calling for a minimum $100 a month company-paid pension program above and beyond social security payments. In other resolutions, they called for the industry-wide establishment of the six-hour day and 30-hour week, a uniform rate of pay for similar jobs and work loads in the industry, and development of civil defense programs by industry to protect workers in the event of an attack. A continuing drive to sign up unorganized workers in the rubber and allied industries was also endorsed.

Three proposed resolutions were turned down by delegates who followed committee recommendations. A proposed resolution calling for industry-wide bargaining, particularly among the "Big Four" rubber companies, was voted down. Delegates also turned down a resolution that would have urged abandonment of the piecework system in the industry. Also defeated was a resolution calling for the establishment of a director of cooperative organization in the CIO.

Delegates to the convention pledged support to the U. S. mobilization program, the North Atlantic Treaty Organization, Point-Four Program, Mutual Security Administration program, and the role of the government and the United Nations in Korea.

CD Mold Release A Solution

A highly effective low cost silicone solution developed specifically for the release of plastic and rubber parts from molds has been introduced by the Chemical Development Corp., Danvers, Mass. Called "CD Mold Release A", the product does not contain powders, mineral oils or waxes. It does not discolor light plastics nor produce burnt areas. The solution is said to dry instantly and does not carbonize or decompose and hence there is never any build-up on the mold itself. The new product is non-inflammable and non-corrosive and has excellent adherence to metal.

Griffith Rubber Names Johnson

Norman Johnson

Norman Johnson has been appointed assistant to the president of the Griffith Rubber Mills, Portland, Ore. Mr. Johnson has been with the organization for over ten years and for the past year has served as assistant general manager. He served as assistant treasurer of the firm from 1947 to 1951. As a member of the rubber industry's "watch dog" committee, Mr. Johnson has worked with the Senate Small Business Committee on matters of rubber allocation and controls for the past two years.

Russia Buying More Rubber

Soviet Russia and her Communist satellites have stepped up their purchases of natural rubber to take advantage of a fall in prices, it is reported in financial circles. British rubber shipments to the Soviet Union for the first seven months of the year totaled 65,886 tons values at £26,262,622 ($72,929,281). Russian purchases over the same period last year were only 18,460 tons worth £10,315,000 ($28,882,000). Britain restricts Empire rubber shipments to Russia to 80,000 tons a year. One explanation for the sizable jump in exports, other than the low price, was that the Soviet Union has switched its buying to London, whereas last year several big purchases were made directly in Malaya. The 80,000-ton quota takes into account buying anywhere in the Commonwealth.

Joan Palooka Scented Doll

Said to be the first doll made with built-in body fragrance, the "Joan Palooka" doll, manufactured by the Ideal Toy Corp., New York, N. Y., looks, feels and smells like a freshly bathed and powdered baby. Patterned after the daughter of comic strip hero Joe Palooka, the new doll features a doll skin compounded of a special rubber latex compound. The doll head is formed of a Vinylite plastic material with a softness and warmth of touch. Dressed in the latest baby style, each doll comes complete with her own cake of baby soap and a can of baby powder.

An index to Volume 71 of RUBBER AGE will be found on Pages 139 to 142 of this issue.

RMA HOLDING INTERESTING SEMINARS ON NATURAL RUBBER QUALITY

The Crude Rubber Committee of the Rubber Manufacturers Association held the first of its scheduled seminars on natural rubber quality on September 15 and 16 at the Mayflower Hotel in Akron, Ohio. The seminars are designed to assist rubber manufacturers to secure full value from their natural rubber purchases. The second scheduled seminar was held on September 30 and October 1 at the Stacey-Trent Hotel in Trenton, N. J.

The Akron seminar attracted approximately 230 persons representing some 50 companies, while the Trenton seminar drew about 110 people from some 60 companies in the area. W. J. Sears, vice-president of the RMA, addressed both sessions. Mr. Sears warned that unless there

W. J. Sears addressing the RMA seminar at Akron.

is an improvement in the uniformity of natural rubber it will not be able to compete with synthetic rubbers.

Mr. Sears told company representatives that if they adopt the buying and inspection methods recommended during the seminars, their rubber shipments will be better. He cited instances where inadequate testing and sampling procedures cost consumers considerably more money than they should have paid.

He stressed the point that if more and more companies buying natural rubber insist upon their shipments being up to industry standards, Far Eastern packers will be forced to meet these requirements. RMA, working in cooperation with the Rubber Trade Association, has established 30 grades for natural rubber.

The Akron seminar included a series of talks by industry representatives on the problem of natural rubber quality control. J. P. Seiberling, president of the Seiberling Rubber Co., pointed out that during the years since the end of World War II, the industry took what natural rubber it could get and as a result, natural rubber quality fell off sharply. Mr. Seiberling insisted that if more companies would adopt the RMA standards and put them into practice, brokers and dealers would be much more careful as to who did their packing.

Dr. R. P. Dinsmore, vice-president in charge of research and development for the Goodyear Tire & Rubber Co., noted that years ago the industry had attempted to set up a system to classify rubber by its technical properties. This was soon found to be impractical, he explained, since rubber is an agricultural product grown by hundreds of thousands of individuals in widely scattered areas.

E. A. Stevens, treasurer of the B. F. Goodrich Co., declared that the new RMA program is long overdue. He said that present difficulties have been created by certain packers in the Far East who refuse to do a proper job in the classification of their rubber into proper grades as specified by RMA.

The meeting was also addressed by J. J. Blandin, vice-president of the Goodyear Rubber Plantation Co., and Charles Burke, assistant to the president of the General Tire & Rubber Co. Among others presenting various phases of the buying and inspection problem were: R. B. Bogardus, assistant manager of crude rubber buying for Goodyear; Val Wulff, assistant rubber buyer for Firestone; E. C. Schwab, director of rubber purchasing for U. S. Rubber; Ralph Au, manager of rubber purchasing for Goodrich; and C. J. Zabic, director of rubber purchases for General Tire.

Another seminar was scheduled to have been held on October 14 and 15 at the Georgian Room of the Hotel Statler in New York City. Other seminars are to be held on October 21 and 22 at the Hotel Somerset in Boston, Mass.; November 18 and 19 at the Hotel Congress in Chicago, Ill.; and on December 9 and 10 at the Statler Hotel in Los Angeles, Calif.

In addition to the seminars, a panel exhibit and display of RMA type samples will be shown during the three-day meeting of the Rubber Division, A.C.S., to be held on October 29-31 at the Hotel Statler in Buffalo, N. Y. Mr. Sears will present a paper dealing with natural rubber quality and packing problems and inspection procedures, but there will not be any formal seminar at the division meeting according to present plans.

Increases Latex-Lube Facilities

DuBois Co., Inc., has announced that both its Cincinnati and Los Angeles plants are now set up to supply the new peptizing grade of "Latex-Lube (Pigmented)". This modified material for rubber surface lubrication is recommended particularly for high cold flow stocks, and for any stock handling or piling operations where sticking is a problem. The company emphasizes that the product is essentially a non-saponaceous type material, as contrasted with the standard Latex-Lube GR, generally employed. DuBois has also announced the assignment of chemical engineer A. T. Peterson to assist in rubber industry service problems in the field. Mr. Peterson will be active in connection with plant applications of Latex-Lube compounds. He will operate out of the home office in Cincinnati.

Elastomer Group Meeting

The first meeting of the 1952-53 season of the Elastomer and Plastics Group was scheduled to be held on October 16 at the Massachusetts Institute of Technology, Cambridge, Mass. Dr. Malcolm H. Smook (DuPont) was to have addressed the group on "Utilizing the Properties of Hypalon S-2". The speaker was to make a brief comparison between the common elastomers and Hypalon S-2, with some emphasis on structural differences. Specific examples of how Hypalon S-2 is now being used and where the use of blends is advantageous was to have been discussed.

Quebec Holds Stag Dinner

The September 26th meeting of the Quebec Rubber and Plastics Group held at the Queen's Hotel in Montreal, Que., Canada, took the form of a stag dinner. Approximately 80 members and their guests were in attendance. The meeting featured a program of entertainment and the showing of a film which was taken at the group's annual golf tournament in June.

Some of the 230 persons who attended the RMA seminar on natural rubber quality on September 15 and 16 in Akron, Ohio are shown above.

SPI HEARS STUBBLEBINE SPEAK ON RUBBER IN A PLASTICS WORLD

The September 23rd meeting of the Society of Plastic Engineers held in Baltimore, Md., was addressed by Dr. Warren Stubblebine, director of development for the Connecticut Hard Rubber Co., New Haven, Conn. Dr. Stubblebine spoke on "Rubber—In a Plastics World".

A review of the properties of the major types of rubber, both natural and synthetic, was presented together with a discussion of the specific properties of each of the rubbers, with emphasis on the applications that arise from the particular combination of properties found in each of the materials. The specific properties wherein rubbers differ completely from plastics, particularly those of elasticity and resilience, were discussed at some length.

The question of the economics of processing, fabrication and final product was also discussed. In addition, a review of the basic properties in the selection of a specific material, whether plastic or rubber, to meet a certain set of application requirements was presented. Misapplications of both plastics and rubber, particularly in those cases where low compression set, chemical resistance and cold flow properties are concerned, were presented in great detail, and the advantages of each of the synthetic rubbers were stressed.

Applications calling for true elasticity and resistance to cold flow can not be filled by any of the plastics generally available. In addition, many applications calling for chemical resistance can be met adequately by synthetic or natural rubber, the speaker said.

The specific differences in processing characteristics of the various synthetic rubbers were discussed, and the major points of difference between these types of processing and that normally used in the plastics industry were noted.

ASTM Publishes 50-Year Index

The American Society for Testing Materials, 1916 Race St., Philadelphia 3, Penna., has published a new comprehensive index to all technical papers and reports published by the society for a fifty year period through 1950. The index lists, under appropriate subject headings, all ASTM papers and reports whether they appeared in the *Proceedings, ASTM Bulletin*, special compilations, special technical publications, or as data appended to committee reports. The 230-page book is available from ASTM for $4.75 for members and $6.00 for non-members.

Southern Ohio September Meeting

The September 11th meeting of the Southern Ohio Rubber Group held at the Engineer's Club, Dayton, Ohio, attracted approximately 120 members and guests. Principal speaker of the evening was Everett Baugh, staff engineer of the Cleveland Tank Plant, General Motors Corp. Mr. Baugh spoke on "The Application of Rubber in Military Vehicles." The speaker exhibited a complete display of rubber parts used in the Walker Bulldog tank. Following the talk there was a showing of the motion picture "Fishing in Alaska".

Coming Events

Oct. 20-24. 40th National Safety Congress and Exposition, Chicago, Ill.

Oct. 24. New York Rubber Group, Henry Hudson Hotel, New York, N. Y.

Oct. 29-31. Rubber Division, A.C.S., Fall Meeting, Hotel Statler, Buffalo, N. Y.

Nov. 11. Los Angeles Rubber Group, Hotel Mayfair, Los Angeles, Calif.

Nov. 13. No. California Rubber Group, Elks Club, Berkeley, Calif.

Nov. 14. Connecticut Rubber Group Fall Meeting.

Nov. 21. Chicago Rubber Group, Morrison Hotel, Chicago, Ill.

Dec. 4. Ft. Wayne Rubber and Plastics Group, Hotel Van Orman, Ft. Wayne, Ind.

Dec. 12. Boston Rubber Group, Hotel Somerset, Boston, Mass.

Dec. 12. Detroit Rubber & Plastics Group, Xmas Party, Detroit-Leland Hotel, Detroit, Mich.

Dec. 12. Los Angeles Rubber Group, Xmas Party, Hotel Statler, Los Angeles, Calif.

Dec. 12. New York Rubber Group Xmas Party, Henry Hudson Hotel New York, N. Y.

Dec. 13. So. Ohio Rubber Group, Miami Valley Golf Club, Dayton, Ohio.

Dec. 16. Buffalo Rubber Group, Xmas Party.

Dec. 19. Chicago Rubber Group, Xmas Party, Morrison Hotel, Chicago, Ill.

Mar. 18-20, 1953. Rubber Division, A.C.S., Hotel Statler, Los Angeles, Calif. (In conjunction with 122nd meeting of A.C.S.).

May 27-29, 1953. Rubber Division, A.C.S., Spring Meeting, Hotel Statler, Boston, Mass.

Sept. 9-11, 1953. Rubber Division, A.C.S., Fall Meeting, Hotel Sherman, Chicago, Ill.

Named Boston Meeting Chairman

The Division of Rubber Chemistry of the American Chemical Society has announced that H. W. Sutton of the Boston Woven Hose and Rubber Co., has been designated general chairman for the Boston meeting of the division which is scheduled for May 27 to 29. John Andrews of Godfrey L. Cabot, Inc., had previously been named general chairman of the Boston meeting. However, Mr. Andrews is being transferred to England by his company.

CONNECTICUT GROUP OUTING FEATURES ATHLETIC CONTESTS

The Seventh Annual Outing of the Connecticut Rubber Group was held at the Grassy Hill Park in Derby, Conn. on September 13 with approximately 170 members and their guests in attendance. Ray Dudley (Whitney Blake) acted as chairman of the Outing Committee. Other committee members included Dave McKean and Whitey Larson (Whitney Blake), George Sprague and Guy Di Norscia (Sponge Rubber Products).

The program consisted of golf, horseshoes, and an egg-throw, and featured the annual softball game. R. E. Blake (U. S. Rubber) took first place in the horseshoe game while second place went to N. F. Riley (U. S. Rubber). The egg-throw was won by a team consisting of S. Ericksburg (Monsanto) and F. F. Villa (Accurate Insulated Wire). In the softball game, "Naugatuck" beat the "Peddlers". All the games were umpired by N. W. Hess (U. S. Rubber) and G. Wilkison (Jenkins Bros.).

The golf tournament was held from 8:00 A.M. to 12 noon at the Highland Golf Course, Shelton, Conn. C. R. Ekwall (U. S. Rubber) won low gross while low net went to S. B. Boyd (U. S. Rubber). R. Potter (M. B. Mfg.) won high gross honors.

Northern California Activities

The Northern California Rubber Group held its annual summer outing and picnic on August 10 at the Old Hearst Ranch, Pleasanton, Calif. Dick Clausen (Pioneer Rubber Mills) served as chairman of the Outing Committee. Members of the committee were Bob Gray, John Mason, Stan Mason, Herb Wiley and George Whitney, all of Pioneer Rubber Mills. The day's activities included golf, horseback riding and swimming. Dinner was served and many door prizes awarded. On September 26, the Burke Rubber Co. was host at the annual "Beer B Q" at Wieland's Gardens in San Jose, Calif. Approximately 70 members and their guests attended. Dinner was served and entertainment provided. The next meeting of the group has been scheduled for November 13 at the Elks Club in Berkeley, Calif. Dr. B. S. Garvey, Jr., of Sharples Chemicals Inc., will address the group on "The Compounder in the Rubber Industry."

New York Fall Meeting Program

The Fall Meeting of the New York Rubber Group scheduled to be held on October 24 at the Henry Hudson Hotel in New York City will feature two interesting technical papers. Dr. A. Szegvari of the Union Process Co., Akron, Ohio, will deliver a paper on "Fine Grinding of Latex Dispersions," while Dr. Harry L. Fisher, special assistant to the director of the Office of Synthetic Rubber, Reconstruction Finance Corp., Washington, D. C., will speak on "Latest Developments in Synthetic Elastomers." Dinner, immediately preceded by a cocktail hour, will be served at 7:00 P. M. A program of entertainment will follow.

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Studies in Hevea Rubber

Some time ago a series of investigations were undertaken at the Rubber Research Institute of Malaya by Dr. G. F. Bloomfield of the British Rubber Producers' Research Association. The results of this investigation, part of the joint program of fundamental rubber research undertaken by the two organizations, have now been published in a series of six papers, Parts I and II appearing in Communication No. 271, Parts III and IV in Communication No. 272, and Parts V and VI in Communication No. 273. The articles cover the following subjects: (1) Molecular State of the Rubber Hydrocarbon in Freshly Tapped Latex; (2) The Gel-Content of Rubber in Freshly-Tapped Latex; (3) Fractionation of Fresh Rubber and the Interpretation of Viscometric and Osmotic Data; (4) Factors Affecting the Plasticity of Raw Rubber, and Some New Data on Hardening of Rubber by Benzidine; (5) Oxygenated and Low Molecular Fractions in Fresh Rubber; (6) Characteristics of Rubber in Latex of Untapped Trees and in Branches of Trees in Regular Tapping. Copies of the communications can be secured on request from the Rubber Research Institute of Malaya, Kuala Lumpur, Malaya.

Rubber Plant Maintenance

In recognition of sky-rocketing costs of maintenance in the rubber industry and the added engineering and personnel problems due to increasing mechanization, it has been decided to set aside two sessions of the forthcoming Plant Maintenance Conference exclusively to a discussion of rubber goods plants. The conference is scheduled to take place at the Public Auditorium in Cleveland, Ohio, from January 19 to 22, 1953, concurrently with the Plant Maintenance Show. The sessions devoted to the rubber goods industry will be round-table discussions conducted by a chairman and a discussion leader. The first session will take place on Tuesday, January 20, from 2:00 to 4:30 P.M., and the second at the same time on the next day. Those attending the first session will be encouraged to submit questions for answer at the second meeting. Industry leaders from all parts of the country are expected to attend. In addition to the two sessions devoted exclusively to the rubber goods industry, there will be 64 other meetings dealing with general aspects of plant maintenance. Advance registration cards may be obtained from Clapp & Poliak Inc., 341 Madison Avenue, New York 17, N. Y.

Argus Names Sales Agents

Argus Chemical Laboratory, Brooklyn, N. Y., has appointed Philipp Brothers Chemicals, Inc., Boston, Mass., as sales agents in New England for Argus Mark Stabilizers and Vinylum Metallic Pastes. The new arrangement will permit stocks to be carried at strategic points in New England and will enable Argus to improve its delivery service to customer's plants. The addition of Mark Stabilizers to the Philipp Brothers' line of plasticizers, rounds out their offerings of products for the vinyl field.

EXPERIMENTAL OIL MASTERBATCH POLYMER NUMBERS ASSIGNED BY RFC

Listed below are types and properties of new experimental oil-masterbatch polymers which have been authorized by the Office of Synthetic Rubber, Reconstruction Finance Corporation. In order to allow consumers of oil-masterbatch an opportunity to determine the interchangeability of processing oils currently in use in oil-masterbatches, the entire oil-masterbatch program has been placed on an experimental basis. All regular numbers assigned to oil-masterbatches have been cancelled, and only those experimental oil-masterbatches listed below will be produced. Processing oils to be evaluated are Circosol 2XH, Sundex 53, Shell SPX-97, Dutrex 20 and Califlux TT.

X-Number	*Polymer Descriptions—Oil Masterbatches*
X-628	25 parts Circosol-2XH + 100 parts high Mooney 20% bound styrene polymer, sugar-free, iron activated, 50/50 rosin/fatty acid emulsified, carbamate short-stopped, 41° F. reaction temperature, staining stabilizer. Mooney of masterbatch 50-70 ML-4.
X-654	25 parts Shell SPX-97 + 100 parts high Mooney 20% bound styrene polymer, sugar-free, iron activated, 50/50 rosin/fatty acid emulsified, carbamate short-stopped, 41° F reaction temperature, staining stabilizer. Mooney of masterbatch 50-70 ML-4.
X-693	25 parts Circosol-2XH + 100 parts high Mooney 20% bound styrene polymer, sugar-free, iron activated, 50/50 rosin/fatty acid emulsified, carbamate short-stopped, 41° F reaction temperature, staining stabilizer Wingstay-S or equivalent. Mooney of masterbatch 50-70 ML-4.
X-700	25 parts Dutrex 20 + 100 parts high Mooney 20% bound styrene polymer, sugar-free, iron activated, 50/50 rosin/fatty acid emulsified, carbamate short-stopped, 41° F reaction temperature, staining stabilizer. Mooney of masterbatch 50-70 ML-4.
X-706	37.5 parts Shell SPX-97 + 100 parts high Mooney 20% bound styrene polymer, sugar-free, iron activated, 50/50 rosin/fatty acid emulsified, carbamate short-stopped, 41° F reaction temperature, staining stabilizer. Mooney of masterbatch 45-65 ML-4.
X-709	50 parts Circosol-2XH + 100 parts high Mooney 20% bound styrene polymer, sugar-free, iron activated, 50/50 rosin/fatty acid emulsified, carbamate short-stopped, 41° F reaction temperature, stabilizer Wingstay-S. Mooney of masterbatch 55-75 ML-4.
X-712	25 parts Sundex 53 + 100 parts high Mooney 20% bound styrene polymer, sugar-free, iron activated, 50/50 rosin/fatty acid emulsified, carbamate short-stopped, 41° F reaction temperature, staining stabilizer. Mooney of masterbatch 50-70 ML-4.
X-713	25 parts Sundex 53 + 100 parts high Mooney 20% bound styrene polymer, sugar-free, iron activated, rosin emulsified, carbamate shortstopped, 41° F reaction temperature, slightly staining stabilizer. Mooney of masterbatch 50-70 ML-4.
X-714	25 parts Shell SPX-97 + 100 parts high Mooney 20% bound styrene polymer, sugar-free, iron activated, rosin emulsified, carbamate shortstopped, 41° F reaction temperature, slightly staining stabilizer. Mooney of masterbatch 50-70 ML-4.
X-715	25 parts Califlux TT + 100 parts high Mooney 20% bound styrene polymer, sugar-free, iron activated, 50/50 rosin/fatty acid emulsified, carbamate short-stopped, 41° F reaction temperature, staining stabilizer. Mooney of masterbatch 50-70 ML-4.
X-716	37.5 parts Sundex 53 + 100 parts high Mooney 20% bound styrene polymer, sugar-free, iron activated, 50/50 rosin/fatty acid emulsified, carbamate short-stopped, 41° F reaction temperature, staining stabilizer. Mooney of masterbatch 45-65 ML-4.
X-717	37.5 parts Circosol-2XH + 100 parts high Mooney 20% bound styrene polymer, sugar-free, iron activated, rosin acid emulsified, carbamate shortstopped, 41° F reaction temperature, staining stabilizer. Mooney of masterbatch 45-65 ML-4.
X-718	37.5 parts Circosol-2XH + 100 parts high Mooney 23.5% bound styrene polymer, peroxamine activated, fatty acid emulsified, carbamate shortstopped, 41° F reaction temperature, stabilizer Polygard or equivalent. Glue-acid coagulated. Mooney of masterbatch 45-65 ML-4.
	Polymer Description—Oil-Black Masterbatch
X-629	50 parts HAF black + 25 parts Circosol-2XH + 100 parts high Mooney 20% bound styrene polymer, sugar-free, iron activated, 50/50 rosin/fatty acid emulsified, carbamate shortstopped, 41° F reaction temperature, staining stabilizer. Compound Mooney of masterbatch 55-75 ML-4.

The above new polymers are experimental only and the Office of Synthetic Rubber, Reconstruction Finance Corporation, does not make any representations or warranties of any kind, express or implied, as to the specifications or properties of such experimental polymers, or the results to be obtained from their use.

World Bestos Promotes Nanfeldt

William J. Nanfeldt

William J. Nanfeldt has been named general manager of the World Bestos Division of the Firestone Tire & Rubber Co. Mr. Nanfeldt was one of the founders of World Bestos in New Haven, Conn., 30 years ago. He remained with the company when it was purchased by Firestone in 1937, and he has advanced to his present position successively through research, engineering, production and plant management. As general manager, he succeeds Donald H. Spicer, who has resigned. In other personnel changes at the New Castle, Ind., plant, the promotion of William F. Rogge from manager of the Replacement Sales Division to general sales manager also was announced. R. A. Riley, who has been comptroller since 1942, will continue in that position, but with added management responsibilities. L. G. Kersgard will continue as manager of special accounts. Mr. Rogge joined the Firestone subsidiary in 1948. Mr. Riley was manager of sales accounting at the Firestone Industrial Products plant at Fall River, Mass., before becoming comptroller for World Bestos. He has been associated with Firestone since 1937.

RC Palmitic Plasticizer 0-16

Rubber Corporation of America, Brooklyn, N. Y., has announced the development of a new plasticizer, "Iso-Octyl Palmitic (0.16)." As a secondary plasticizer in polyvinyl chloride compositions, the product is said to add anti-blocking properties and increases the heat stability by functioning as an internal lubricant. This new plasticizer does not show the tendency toward discoloration and rancidity exhibited by esters of unsaturated fatty acids. In vinyls, it is usually used to replace 10-15% of the other plasticizers in the compound. In organosols and plastisols, it reduces initial viscosity and tends to increase the viscosity stability on storage. Use is also indicated as a plasticizer for synthetic rubbers and nitrocellulose. Specifications for the product are given as follows: Appearance—clear liquid; Color, APHA—200 maximum; Odor—mild; Specific Gravity, 20/20° C.—0.863 ± 0.003; Acidity, as Palmitic—0.2% maximum; Moisture—0.05% maximum.

Airkem Odor Counteractants

Airkem, Inc., producers of the well-known consumer product for odor control sold under the name of Air-Wick, has developed a series of odor counteractants for specific use in the rubber manufacturing field. Some of these industrial odor counteractants are already being used in several different types of cellular rubber products, including latex foam sponge, such as mattresses, pillows and carpet backing. They are also being utilized in latex cement compositions. The Airkem industrial odor counteractants, which are built on the background of research required for the development of Air-Wick, and which contain chlorophyll, are not odor substitutes. According to the company, rather than covering bad odors with another strong odor, the Airkem products will reduce or eliminate the apparent odor. It is reported that in practical applications with several rubber concerns, Airkem has been able to reduce odor level 75% in latex foam sponge at a cost of less than 0.5c per pound or finished product. Airkem can be supplied in mineral oil or in water emulsions, according to the customer's needs. Since the odor problems in expanded rubbers vary widely from manufacturer to manufacturer, individual attention is generally given to each specific application. Another use of these new odor counteractants in the over-all rubber field is in the treatment of stack exhausts at rubber reclaiming plants. Airkem, Inc., maintains headquarters at 241 East 44th St., New York 17, N. Y.

New International Shoe Plant

International Shoe Co. has announced plans for the construction of a new processing plant for rubber composition heeling and soling materials at Bryan, Texas. Construction of the plant, which will contain approximately 70,000 square feet, will begin early next year. It will employ approximately 200 workers and will be built so that it can be expanded to meet future company requirements. It is expected that the plant will be in production in the fall of 1953. Output from the plant will be utilized entirely by the company in the manufacture of its shoes. The site for the new building was arranged for and partially financed by the Bryan Foundation.

WASHINGTON APPOINTMENTS

Thomas C. Keeling, Jr., on leave from his position as assistant vice-president and sales manager of the Chemical Division of the Koppers Co., has been appointed deputy director of the Chemical Division of the National Production Authority.

Richard A. McDonald has been named to succeed Henry H. Fowler as Administrator of NPA. Mr. Fowler has been named Defense Mobilizer in addition to his post as Defense Production Administrator.

Horace B. McCoy, formerly assistant administrator and director of the Office of Industry and Commerce of the Department of Commerce, has been named deputy administrator of NPA.

Willard Named Factory Manager

Henry W. Willard

Henry W. Willard has been appointed factory manager of the Passaic, N. J., plant of the U. S. Rubber Co., succeeding William C. Bowker, who has retired. Mr. Willard started with the company in 1929, working as an office boy during summer vacation. In 1934 he began as a time clerk in the Passaic plant, and since then has held a wide variety of positions. He was promoted to the office of general superintendent on May 19, 1950, and assistant factory manager on January 2 of this year. Mr. Willard is a graduate of Cornell University. Mr. Bowker recently completed 47 years of service with the company, starting in the Passaic plant as a clerk in 1905. Later he was transferred to the central offices in New York City, and in the 1920's managed the company's Cleveland and Chicago factories. He returned to the Passaic plant in 1930.

Dura-Flex "Vinylaire" Sponge

A new vinyl plastic sponge made from Geon vinyl resin has been introduced by the Dura Flex Co. of Santa Monica, Calif. Called "Vinylaire," the new product is said to be light in weight and will not deteriorate from perspiration or rubbing oils when used as a padding for football players. The vinyl sponge will not absorb odor, perspiration or oil. The new sponge product is now being used by the Washington Redskins, professional football team. Dura Flex also reports that the material is being used by several major league baseball teams as a padding for gloves. It is also being used in the shoe business as an inner sole. Vinylaire will not turn hard upon aging, the company said, a common problem with foam rubber.

Triples Butyl Chloride Capacity

Butyl chloride production capacity has been tripled according to an announcement by the Carbide and Carbon Chemicals Co., a division of the Union Carbide and Carbon Corp. The increased production will meet the growing demand for butyl chloride and will permit the development of new and expanded uses. Butyl chloride can be used in the preparation of rubber chemicals, plasticizers, and stabilizers for synthetic resins.

RECENT GORDON CONFERENCE FEATURES ELASTOMERS SECTION SYMPOSIUM

The 1952 Gordon Research Conference sponsored by the American Association for the Advancement of Science at Colby Junior College in New London, N. H., featured an Elastomer Conference which was held from June 30 to July 4. J. D. D'Ianni (Goodyear) served as chairman of the Elastomer Conference, with M. Morton (Akron University) as vice-chairman. Daily activities at the Elastomer Conference centered about specific subjects during which time applicable papers were heard. At the conclusion of the papers, a discussion period was held.

Among the subjects under discussion were emulsion polymerization, physical properties of latex, dynamic properties of rubber, crystallization phenomena and structural effects, the chemistry of vulcanization, and degradation. Among those leading the discussions were the following: W. V. Smith (U. S. Rubber), J. A. Davison (U. S. Rubber), H. L. Williams (Polymer Corp.), J. A. Yanko (Goodrich), J. Rehner, Jr. (Esso Laboratories), R. Buchdahl (Monsanto), A. W. Meyer (U. S. Rubber), A. M. Bueche (General Electric), D. Craig (Goodrich), C. M. Doede (Connecticut Hard Rubber), and J. O. Cole (Goodyear).

Papers Presented at Conference

Among the many interesting popers presented at the conference was one entitled "Loci in Emulsion Polymerization," by Maurice Morton (Akron University). In his paper, the emulsion polymerization of chloroprene was used to illustrate the importance of the various possible loci of initiation of polymer particles.

In the case of the usual water-insoluble monomers, such as styrene, the soap micelles are the only important locus for the initiation of polymer particles, because of their role in solubilizing monomer in the water phase, the author said. However, in the case of a very reactive monomer such as chloroprene, other loci assume some importance as well. Thus, the slight amount of chloroprene dissolved in the water can lead to a substantial initiation of polymer particles under suitable conditions. As a matter of fact, at sufficiently high temperatures (40° C.), or with active redox initiators, the presence of soap micelles does not contribute much to the initiation of the particles, because the latter can apparently be formed very rapidly in the true aqueous phase.

In addition, the author noted, the interface between the water and the emulsified monomer droplets shows some activity in initiating particles in chloroprene polymerization. This is shown by the effect of agitation on the polymerization rate. Whereas in the case of styrene an increase in agitation does not affect the rate of polymerization, it does have a marked effect in the cast of chloroprene, under certain conditions of temperature and initiator levels.

The conclusion can be drawn that the important loci for the initiation of particles in emulsion polymerization may depend on the reactivity of the monomer and the reaction conditions, the soap micelles not being necessarily the only important locus, Dr. Morton concluded.

Frank M. Rugg (Bakelite) delivered a paper on "Infrared Structural Studies of Polyethylene and Changes on Oxidation" at the conference. The speaker reported that a series of polyethylene resins made by making progressive changes in temperature, pressure, and catalyst content have been studied by infrared absorption spectroscopy. From the methyl content and the number average molecular weight of each resin, it was found that as molecular weight increases degree of branching decreases. Also revealed was the fact that each of the three types of double bond groups present, i.e., $RHC = CH_2$, $RHC = CHR$, and $RRC = CH_2$, decrease in concentration with increasing molecular weight, the speaker said.

Use of Polarized Radiation

Using polarized radiation it has been shown that in polyethylene film extended approximately 500% by cold-drawing, the $-CH_3$ terminated branches are not predominantly oriented either parallel or perpendicular to the direction of stretch. This is in accord with the view that the chain branches vary in length, with some short enough to be essentially at right angles to the long chain axis while others are sufficiently long to be parallel to the long chain axis in stretched polyethylene.

When polyethylene is heat-oxidized or photo-oxidized, carbonyl groups are formed, and the absolute and relative concentrations of the three types of carbon-to-carbon double bonds are altered. Grating spectra in the 5.6 to 6.0 micron region reveal that the carbonyl groups formed by heat-oxidation are mainly ketonic although some aldehyde and acid groups are also present. In photo-oxidized samples, the carbonyl groups are rather well distributed among the aldehyde, acid, and ketone forms.

Colloidal Stability of Latices

E. G. Cockbain (BRPRA), was present at the conference and delivered an interesting paper on "The Colloidal Stability of Rubber Latices." Mr. Cockbain stated that the reversible aggregation and creaming of synthetic emulsions stabilized only with fatty acid soaps or detergents is attributed to an oriented polymolecular adsorption of the stabilizer, whereby the surface of the particles is rendered more hydrophobic. With protein-stabilized emulsions, he said, reversible aggregation is mainly controlled by pH and ionic strength. In the presence of other hydrophilic colloids, such as alginate salts, secondary adsorption of the colloid is postulated, without displacement of the emulsifier film, leading to an interlinking of the particles, Mr. Cockbain explained.

The gellation of natural latex at elevated temperatures by polyethers, such as polyvinylmethyl ether, is due both to their negative temperature coefficient of solubility and their high surface activity. Adsorption of the polyether on to at least part of the surface of the rubber particles is essential. The stabilizing effect of fatty acid soaps in the latex must also be diminished, e.g., by reduction in pH or addition of cations. Results were given by the author showing that suitable polyglycol ethers of the polyoxyethylene oxypropylene diol type were very effective heat-sensitive gelling agents for natural latex.

A paper on "The Cold Mastication of Rubber" by W. F. Watson (BRPRA) was read at the conference by Mr. Cockbain. In this paper, the author pointed out that the degradation whereby rubber is plasticized by cold milling depends on an initial rupture of the rubber hydrocarbon into polymeric free radicals by the applied shearing forces. These free radicals recombine under nitrogen, explaining the long-known observation of no plasticizing in an inert atmosphere. Oxygen readily attacks these free radicals and changes the eventual termination into a reaction not involving combination of polymeric radicals.

The anomalous negative temperature coefficient of plasticization by cold milling is explicable by the increasing viscosity and, hence, applied shear. The mechanism is critically tested by milling in nitrogen after addition of compounds likely to function, as does oxygen, by interfering with the secondary recombination after the primary mechanical scission. Forty-seven substances were listed as competing with recombination with varying efficiency, from mercaptans as effective as oxygen to substances such as phenol, with only a detectable action. A similar mechanism applies to the cold milling of synthetic rubbers. With certain substances, such as maleic anhydride and chloranil, the eventual radical termination involves the rubber molecules, giving branched or cross-linked rubbers.

Allylic Structure Discussed

The probable allylic structure of the radicals formed by rupture and their chemical activity towards the added compounds was also discussed. The factors influencing efficient mastication, the function of peptizers, and degradation under other types of rapid deformation were considered according to the mechanical-rupture mechanism.

"Some Fundamentals of Emulsion Polymerization" was the title of a paper presented by E. J. Meehan (University of Minnesota). In the first part of his paper new redox systems were described for the emulsion copolymerization of butadiene-styrene. One of the new systems makes use of the reaction between chromium (VI) and arsenic (III) in slightly alkaline (soap) medium to produce free radicals which initiate polymerization. This system is suitable for use at temperatures of 20 to 40°C. Other new redox systems have been developed for use at temperatures around 0°C. These make use of the reaction between an iron (II) complex and an organic hydroperoxide to produce free radicals. The concentration of iron (II) in the system is maintained at a suitable value by the addition of a reducing agent which continually reduces the iron (III) formed in the rapid reaction of iron (II) with the hydroperoxide. Hydrazine and sodium sulfide were found suitable reductants when ethylene diamine tetraacetate was the complexing agent for iron, he said.

The other part of Mr. Meehan's paper dealt with the mechanism of persulfate as an initiator of emulsion polymerization, including kinetic, radioactive, and chemical studies. Studies on the mechanism of initiation of emulsion polymerization by persulfate were reviewed and discussed.

E. K. Gladding (DuPont), presented a paper on the "Oxidation of Neoprene." The author stated that the oxidation of poly-2-chlorobutadiene (neoprene) and poly-2,3-dichlorobutadiene is accompanied by the formation of peroxidic materials, carbonyl compounds, acids and acid chlorides. The acid chloride function is a characteristic oxidation product of these chlorine-substituted polymers and experiments with model compounds show that it is formed from a configuration equivalent to two adjacent monomer units of the polymer.

Vexing Problem Solved

A problem that had stumped experts for years was solved recently when five employees of the American Cyanamid Co. submitted an ingenious suggestion on how to remove a rubberlike coating from aluminum plates and frames at the company's Willow Island, West Va., plant. Their suggestion — that the coating simply be dissolved in toluene —ended the time-consuming manual method of scraping and chipping away the excess rubberlike substance called "Neobon." The group was awarded $1,360 for their suggestion. Last year, 26,986 ideas were submitted through the company's suggestion system.

Mechanism of Degradation

Still another of the papers presented at the conference was "Free Radical Mechanism of Degradation" by Robert Simha (New York University). The author noted that although the fundamental mechanism and kinetics of free radical polymerization are well established, the picture in respect to depolymerization is less clear. Different polymers degrade seemingly in a very different manner. Rather early in the development of polymerization theory, the suggestion was made by Chalmers to consider depolymerization as the reverse of free radical polymerization. In recent years, crucial experiments on the kinetics and nature of products in vinyl degradation have been carried out. Simultaneously the quantitative kinetic theory of depolymerization as a chain reaction was developed by the present author, Wall and Blatz, he said.

The above mentioned experiments were carried out for the most part in a vacuum as a pyrolysis or photodegradation. Detailed application of the theory has so far been made only to these. However, the same kind of kinetics applies to oxydative degradation, as long as the function of oxygen is that of a free radical initiator. Breakdown of the chain backbone exclusively was then considered by the author.

Briefly, the experimental results and their interpretation are these, he noted. We are concerned with three quantities: (1) the over-all rate of conversion, i.e., evolution of volatiles, dC/dt, (2) the rate of decrease of molecular weight,—dM/dC, and (3) the yield of pure monomer, Y. In respect to all three, the polymers studied form a spectrum, At one end are methyl methacrylate and α-methyl styrene for which large dC/dt $\rightarrow$ small —DM/dC $\rightarrow$ large Y. Interchange of the terms small and large leads, in the extreme, to polyethylene. The transition from the former to the latter occurs, in that order, through α-deuterostyrene, p-methyl styrene χ styrene, isobutylene, isoprene, butadiene, methyl acrylate, acrylonitrile.

The degrading system is characterized by two constants, $1/\epsilon - 1$ = propagation/transfer + termination, and δ = transfer/initiation. The first, the length of a zip, is large ($10^3 - 10^4$) in methyl methacrylate and the second is small. For polyethylene and the dienes, the reverse is true. The kinetic analysis makes clear the interdependence of the three previously mentioned quantities, the author explained.

In terms of molecular structure, a large $1/\epsilon$ is brought about by steric hindrance, high in methyl methacrylate which favors depropagation, and/or by the absence of labile groups and active radicals. Their presence is favorable for chain transfer and this explains the sensitivity of the degradation pattern to the substitution of H by D or CH_3 in the α-position (compare the styrenes and the acrylates) and the behavior of ethylene and the dienes. The interpretation is consistent with the picture developed for the pyrolysis and oxidation of hydrocarbons, the effect of substitution on bond strengths, structural influences on transfer in polymerization, and radical reactivities in copolymerization.

Experimental molecular weight curves and rates have been analyzed and absolute rate constants estimated for methyl methacrylate and styrene. Similar data for the dienes are highly desirable, he concluded.

Sulfur Vulcanization

B. C. Barton (U. S. Rubber) delivered a paper on "Mechanism of Sulfur Vulcanization" in which the results of the extensive work of various experimenters on the reactions of sulfur with mono, di, and tetra olefins were summarized and compared with results obtained in the reaction of sulfur with natural rubber. Experimental data were presented to show that in the accelerated reaction of sulfur with rubber the field of crosslinks is dependent on the time and temperature of vulcanization and on the concentration of sulfur, accelerator, zinc oxide and fatty acid.

Conditions necessary for the maximum yield of crosslinks per unit of combined sulfur were also described and when these conditions are met, a linear relationship was shown to exist between the number of crosslinks and combined sulfur.

Variables affecting the formation of zinc sulfide were described and it was shown that when conditions for obtaining a maximum yield of crosslinks are met there is also a linear relationship between number of crosslinks and amount of zinc sulfide formed. Calculations based on the Wall equation relating equilibrium stress to number of crosslinks suggest that this relationship is stoichiometric, the author stated.

The reactivity of various alkyl and alkylene mono and disulfides with natural rubber indicate that two types of reversion occur in natural rubber vulcanizates. The most common type occurs rapidly at normal curing temperature and is due to rupture of alkylene disulfide crosslinks. The second type occurs only slowly at normal curing temperatures and is due to rupture of alkylene monosulfide crosslinks.

A paper on "Hydrogenated Polymers," authored by H. Vernon Jones, C. Wayne Moberly, and W. B. Reynolds (Phillips Petroleum), was presented at the conference by Mr. Reynolds. In their paper, the authors stated that hydrogenation of synthetic elastomers such as polybutadiene and copolymers of butadiene with various vinyl compounds produces a group of thermoplastic resins possessing interesting properties. These materials resemble polyethylene but are generally more flexible, particularly at very low temperatures. For example, hydrogenated polybutadiene can be struck sharply at —100°F without shattering and is not brittle (even though extremely hard) at liquid nitrogen temperatures.

Stages of Hydrogenation

Hydrogenation can be carried to various stages depending upon the properties desired. For most plastic applications an unsaturation of 5 to 30 percent of the original is desirable. Higher unsaturations increase the ability of the products to undergo vulcanization. Some of the more important potential applications for hydrogenated polymers are in wire and cable coating, films, tubing, and various molded items. The trade-mark "Hydropol" is used by Phillips Petroleum Co. in connection with various hydrogenated high polymers now in the development stage in a program which has been supported in part by the Office of the Quartermaster General.

Mark L. Dannis (Goodrich) delivered a paper on "Plasticizers for Polyvinyl Chloride" at the conference in which he noted that the dielectric properties of plasticized polyvinyl chloride are considered indicative of the state of the system. The high dielectric constant found at high temperatures is associated with a liquid-type behavior; the low dielectric constant found at low temperature with a solid-type behavior. The loss factor peak temperature is a demarkation point (by definition) separating these behaviors, and hence is similar to the freezing point of a two-phase, two-component system, he stated.

In a plasticized PVC system the demarkation point will be lowered as the concentration of plasticizer is increased. The amount of lowering also depends upon the cohesive density of the plasticizer. Conventional plasticizers fall within a narrow range of CED's, as expected from the similarity of these polymeric systems to the similar simple systems, he concluded.

"Determination of Synthetic Latex Particle Size and Its Distribution" was the title of a paper presented by S. H. Maron (Case Institute). This paper reviewed work done at Case under the sponsorship of the Synthetic Rubber Division, Reconstruction Finance Corporation, on the determination of synthetic latex particle size and its distribution.

The methods for particle size determination discussed were electron microscopy, soap titration, and light scattering. In the last category were included dissymmetry, wave length exponent variation, and minimum intensity of scattering. Each method was considered from the standpoint of the experimental techniques involved, and its advantages and limitations. Also described was a procedure by means of which it is possible to determine the particle size distribution of a latex from suitable differential creaming data.

A number of other interesting and informative papers were presented at the Elastomer Conference. These papers and their authors are:

"Shear Dynamics in the Rubber State" by I. L. Hopkins (Bell Telephone Laboratories).

"Some Dynamic Studies on Fractions of Diene Polymers" by T. W. DeWitt (Mellon Institute).

"Effect of Free End Fraction of Vulcanizate on Resilience Properties" by R. M. Pierson (Goodyear).

"The Influence of Polymerization Conditions on Structure of Diene Polymers" by W. S. Richardson (Mellon Institute).

"Cross-Linking in National Rubber Vulcanizates" by H. E. Adams (Firestone).

"Radioactive Sulfur in Vulcanization Studies" by I. Auerbach (Goodyear).

Predicts Rising Tire Sales

L. M. Seiberling, vice-president of the Seiberling Rubber Co., in a recent address before the West Virginia State Tire Dealers at White Sulphur Springs, West Va., predicted that the rubber industry will sell 45,000,000 passenger tires and 7,600,000 truck tires for replacement this year, and estimated that these figures would jump to 54,000,000 passenger tires and "about 11,000,000" truck tires by 1956. The market will continue to grow and grow, he said, noting that the saturation point is more than a generation away. Mr. Seiberling also declared that the position of independent tire dealers in the replacement market has dropped from 90% to less than 50% in 25 years, and suggested methods by which independent dealers can insure their position in the field.

Seiberling to Sell Debentures

Seiberling Rubber Co. is planning to increase its working capital by the sale of $3,750,000 of convertible debentures. The borrowing would increase funded debt by $2,550,000, since a $1,200,000 insurance company loan, now outstanding, would be retired. Stockholders were scheduled to vote on the financing plan on October 7. The debentures are to run for fifteen years and are to be sold through underwriters.

NEW INSULATED LIFEBOAT DEVELOPED BY GOODRICH FOR U.S. NAVY

This photograph shows the new insulated life boat. Men at right are riding on the floor liner which has been inflated.

A new rubber lifeboat that inflates in 30 seconds and provides 70° protection for 15 survivors in either sub-zero or blistering tropical weather has been developed by the B. F. Goodrich Co. in cooperation with the Small Craft Design Section of the Bureau of Ships, Department of the Navy. A 3-inch thick floor liner, inflated by hand pump, can be removed to permit cooling the bottom of the boat in hot climate areas. This "floor" can be towed as an additional life raft if necessary. Survivors use nylon boarding nets and ladders permanently attached to the lifeboat which weighs 230 pounds. A canopy automatically blossoms into position as gas fills the arched rubber columns that support it. Fully inflated the lifeboat measures 15 feet, 8 inches in length; 7 feet, 4 inches in width; and allows 3½ feet of head room. Entrance to the boat is through an aft port in the boat's canopy. In cold regions, survivors close this opening with a dual wall seal that also contains insulation dead-air space. In tropic areas, a forward port can be opened to provide forced draft ventilation.

Linde Silicon Oxyhydride

Another recent advance in silicone chemistry is the development of silicon oxyhydride by the Linde Air Products Co., a division of Union Carbide and Carbon Corp. This specialty silicone chemical is said to have outstanding properties as a filler and blowing agent for rubber. Under the influence of heat or chemical agents, silicon oxyhydride can liberate 423 cc. of hydrogen per gram. This liberated gas is sufficient to produce a porous foam structure in natural and synthetic gum stock during conventional curing operations. The residual solid is an effective silica filler of the type normally employed to impart mechanical strength to the finished products.

Names Two Branch Managers

Managerial appointments at two important branch sales offices were recently announced by the Diamond Alkali Co., Cleveland, Ohio. Effective November 1, Earl J. Mills will become manager of the Chicago branch sales office, succeeding the late Charles W. Klaus, and John W. Kennedy will be manager of the southwest district sales office, which has its headquarters at Houston, Texas. The Chicago office supervises Diamond sales activities in a nine-state area comprising Illinois, Indiana, Iowa, Michigan, Minnesota, Wisconsin, Nebraska and the Dakotas. The southwest district embraces the states of Texas, Oklahoma and Kansas.

Sheller Buys Bliss-Held Stock

Sheller Manufacturing Corp., Portland, Ind., has bought at $14.25 a share the 153,400 shares of its common stock held by the E. W. Bliss Co. The total cost, $2,185,950, will be financed by a long-term loan, Sheller officials said. The stock, nearly 14% of the 1,106,680 shares outstanding, will be retired, and the savings of dividends being paid on the Bliss holdings will cover the interest charges and amortization of the loan. Sheller officials noted two benefits from the purchase: It will remove an important potential threat to an orderly market for the securities and it will reduce the number of shares outstanding to 953,280, thereby increasing the earnings per share.

Porter Acquires Watson-Stillman

H. K. Porter Co., Inc., Pittsburgh, Penna., has purchased the Watson-Stillman Co. of Roselle, N. J. The purchase was for cash but the amount was not disclosed. The New Jersey firm produces a complete line of forged steel fittings, hydraulic presses, jacks, pumps, shears, pipe benders and other hydraulic equipment for industry, railroads and the oil and gas field. H. K. Porter plans to operate the firm as a division under the direction of Edwin A. Stillman, president. T. M. Evans, president of Porter, said the acquisition is in line with his company's continuing policy of diversification and expanded operations.

Chemical Exposition Hears Semon

Dr. Waldo L. Semon, director of pioneering research at the B. F. Goodrich Research Center, Brecksville, Ohio, was one of the featured speakers in a symposium on the prospects of chemistry in the next decade held as part of the National Chemical Exposition in Chicago, Ill., from September 8 through 12. Dr. Semon noted in his address that no longer is the rubber industry tied to natural rubber and sulfur; no longer is compounding a "black art". Dozens of new rubbers, hundreds of new pigments and myriads of new ideas are being utilized in the rubber industry for the ultimate benefit of the consumer, he said. Dr. Semon listed 14 types of synthetic rubber so far developed and pointed out that the field is still wide open. In view of the failure to date of efforts to synthesize the molecule of natural rubber, he suggested that it might be possible to grow and harvest root hairs from a rubber plant in deep culture as penicillium is now grown to provide penicillin. Rubber products are currently being demanded to operate all the way from liquid air temperatures to red heat, he said. An inorganic rubber might be the answer, although it sometimes appears that what is needed is an elastomeric metal. Can such be produced? Only time can tell, he concluded.

Fort Wayne September Meeting

Approximately 100 members and guests of the Fort Wayne Rubber and Plastics Group attended the September 25th meeting at the Hotel Van Orman in Fort Wayne, Ind. Principal speaker of the evening was Dr. R. Vernon Jones of the Phillips Petroleum Co., Bartlesville, Okla., who delivered a paper which had been authored by himself and C. Wayne Moberly and W. B. Reynolds. The paper, entitled "Hydrogenated Polymers," covered essentially the same material as the paper presented at the Gordon Conference by Mr. Reynolds this summer. A full report on this paper appears elsewhere in this issue. At an executive meeting, Jack Carlson (Paranite Wire) was appointed secretary-treasurer of the group to fill the unexpired term of Elmer Ramga, who left the Fort Wayne area to accept a position with the J. M. Huber Corp. at Borger, Texas.

Join Technical Sales Staff

Orville H. Heinicke and F. L. Sutton have joined the technical sales staff of the American Resinous and American Polymer Corporations, Peabody, Mass. A graduate of the University of Southern California in 1943 with a degree in chemical engineering, Mr. Heinicke will represent the corporations in Ohio calling on customers in the rubber, chemical, paint and other industries. He was formerly associated with the Sealol Corp. of Providence, R. I. Mr. Sutton, a graduate of Brown University, was formerly associated with U. S. Rubber, Cordo Chemical and R. T. Vanderbilt. In his new capacity, Mr. Sutton will cover American Resinous' and American Polymer's customers in Connecticut and Metropolitan New York.

VINYL SPECIALTIES

A new boat fender made of Geon vinyl plastic is being used on eight Fiberglas Raven sailing boats by the U. S. Coast Guard in their training program at New London, Conn.

Autopoint Co., Chicago, Ill., has introduced a new wallet, billfold and key case all made of Vinylite plastic sheeting embossed with texture of rich Morocco, lizard or alligator grain.

"Tux" license plate frames made of Vinylite elastomeric plastic, are being produced by John Carlson & Sons Inc., Springfield, Mass.

Vinyl Linins, Inc., New York, N. Y., has introduced a new line of "Vinyloom" floor mats for every room of the home. Made of Vinylite plastic sheeting, the mats are molded with deep, springy carpet textures.

A new type window shade made of Vinylite plastic sheeting has been introduced by Transeal, Ltd., Plainfield, N. J. Custom cut to required size, the new shades are applied directly to the glass by wetting the glass, placing the shade against it, and squeegeeing out the water.

Resin Industries, Santa Barbara, Calif., has introduced a new light-weight vinyl plastic "Soaker Spray" hose for lawn or garden made of Geon resin. The product is a continuous length of tubing spirally perforated with small holes.

A lively new bronco molded of Vinylite plastisol resins has been introduced by Cornell Industries, Inc., Brooklyn, N. Y. "Bucko" the bronco, the molded horse head may be affixed to a bicycle or strapped to a child's chest.

Goodrich Tubeless Aircraft Tire

What is said to be the first tubeless tire for use on aircraft has been developed and is now undergoing tests at the B. F. Goodrich Co., Akron, Ohio. According to the company, the new tires assure safer high-speed take-offs and landings, reduce over-all weight of aircraft, simplify assembly, and provide more uniform inflation pressure. Basic construction principles of the new tubeless aircraft tire are similar to those patented and used in Goodrich tubeless tires for passenger cars. The company indicated that the first use of the new tire will be on combat jet aircraft. Rubber compounds used in the tires must be serviceable at temperatures as low as —65° and as high as 160° F. for landing speeds up to 250 mph.

"Kwikstik Foam Rubber Cement"

A new foam rubber cement has been developed by the Columbia Cement Co., Brooklyn, New York. Called "Kwikstik Foam Cement", this new adhesive is quick drying and is said to leave no depression tack. It can easily be applied by brush and is especially suited to the fabrication of foam rubber mattresses, cushions, novelties, etc.

Hewitt-Robins Promotes Griffith

Forrest L. Griffith, formerly superintendent of the Passaic, N. J., plant of Hewitt-Robins Inc., has been promoted to the position of assistant to the general manager of the company's Rubber and Conveyors Divisions. He has been transferred to the executive offices in Stamford, Conn. Hamilton M. Ross, who had been in charge of plant engineering, has been named to succeed Mr. Griffith as superintendent of the Passaic plant. Mr. Ross had also been in charge of the company's Philadelphia plant and he will continue to carry on this function in addition to being plant manager in Passaic. Mr. Griffith has been with Hewitt-Robins since 1948. He was educated at Baltimore Polytechnic Institute and Cornell University. Mr. Griffith is a member of the Cornell Engineering Society, the Niagara Industrial Engineering Society and the Montclair Society of Engineers. Mr. Ross started with the company as a design and layout engineer in 1941. He is a graduate of Rutgers University. Mr. Ross is a member of the American Institute of Mechanical Engineers, the Rutgers Engineering Society and the Pennington Club.

Calls for Highway Modernization

Harvey S. Firestone, Jr., speaking recently at a banquet commemorating the 50th anniversary of the American Automobile Association, called for an all-out effort to modernize the nation's highway system during the next eight years. Otherwise, he declared, that system will be approaching bankruptcy. Deploring the increased loss of life in accidents on unsafe highways which reached 37,500 last year, Mr. Firestone predicted that if the present rate of increase in highway deaths continued, 2,000,000 persons would die in traffic accidents during the next fifty years. The speaker cited the economic losses resulting from dilapidated roads, and urged that for the well-being of the nation a program be undertaken immediately to modernize the nation's highways.

Fisher Receives ACS Nomination

Dr. Harry L. Fisher, who retired in 1950 after a long association with U. S. Industrial Chemicals, Inc., and who is now affiliated with the Office of Synthetic Rubber of the Reconstruction Finance Corp., has been nominated as president-elect of the American Chemical Society. John H. Nair, assistant director of research for Thomas J. Lipton, Inc., was also nominated for the same office. Both nominees have been prominent in A.C.S. affairs and both played active roles in organizing the World Chemical Conclave last year. Dr. Fisher has held many local section and society offices, including chairmanship of the Akron and Western Connecticut Sections. He is also a past chairman of the Division of Rubber Chemistry.

Scholarships for study in the fields of science, engineering or business administration at Cornell University will be established this year by the Rome Cable Foundation, Inc.

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A Word About the Author—

Dr. Royce J. Noble is a well-known consulting chemical engineer and an outstanding expert on latex. He has been intimately associated with latex technology for the past 30 years and has served with one of the leading suppliers of latex compounds and compositions in a technical and executive capacity. During World War II he was associated with the Chemical Warfare Service as a Colonel engaged in both rubber and latex problems. He is eminently qualified as the author of this comprehensive text book on latex and its applications.

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NPA Cites Leviton Manufacturing

The National Production Authority, on September 26, filed a 25-count charge against the Leviton Manufacturing Co. of Brooklyn, N. Y., stating that the firm had violated Order M-12 (Use of Copper and Copper Base Alloys), CMP Regulation 1 (Basic Rules of the Controlled Materials Plan), and CMP Regulation 2 (Inventories of Controlled Materials. The violations allegedly were committed during the first six months of 1951. Also named in the action was Bernard I. Leviton, vice-president of the company. NPA said the case involves the largest unauthorized use of copper and copper-base alloys since the establishment of CMP. The statement of charges claims the Leviton Manufacturing Co. used 555,487 pounds of copper and copper-base alloys in excess of its permitted quantities. The complaint also alleges that the firm, on separate occasions, had excessive inventories of carbon steel strip, carbon steel wire, copper strip, brass strip, brass wire, brass rod, and bronze strip. The charges were scheduled to be heard in New York City sometime in October. The firm is one of the largest manufacturers of electrical wiring devices in the country.

Wax Transportation Problem

The new microcrystalline wax marketed by L. Sonneborn Sons, Inc., of New York, is used by many rubber manufacturers to minimize checking and cracking on long exposure to light. While a boon to its users, it can be a major problem to those who transport it. Recently, 300,000 gallons of this new wax, which is made up of fine crystals, received luxury treatment from engineers when it was proposed to barge it along the Mississippi and Ohio rivers, 2200 miles between the gulf coast and Sonneborn's Daugherty Refinery at Petrolia, Penna. Skeptics said it couldn't be done, since liquid wax "freezes" solid, even in torrid weather, unless it is kept at a temperature above 165°F. Shoveling solid wax out of a tank is something to think twice about. Accordingly, a new transportation method was evolved, with coils for live steam installed in the barge tanks to keep the wax on good behavior. When it arrived at Petrolia three weeks later, it was pumped, still in hot liquid form, into similarly heated tank wagons for further transport.

ASTM Advances Painter and Hess

The American Society for Testing Materials, Philadelphia, Penna., has announced the election of Robert J. Painter as executive secretary of the society and of Raymond E. Hess as associate executive secretary and editor-in-chief. This action was taken by the board of directors following a report of a special committee which had been appointed to recommend a successor to the late C. L. Warwick, long-time executive secretary of the society, who died suddenly on April 23. Both Mr. Painter and Mr. Hess have been members of ASTM for many years. Mr. Hess has been assistant executive secretary and editor, while Mr. Painter most recently has been treasurer and assistant secretary.

LABOR NOTES

The United Rubber Workers, C.I.O., are expected to ask for reopening of negotiations on the disputed contract with the Firestone Tire & Rubber Co. at an early date. Wage and contract agreements accepted tentatively this summer by union negotiators were turned down by Local 7 of Akron and Pottstown, Penna., Local 336. Meanwhile, union and B. F. Goodrich Co. negotiators finally approved a pact affecting 16,000 employees in Akron and eight other cities. Goodyear and the URW had previously signed a new wage increase agreement calling for 10c an hour, the same agreement reached with U. S. Rubber. Firestone and Goodrich negotiations involved working conditions as well as wages.

Employees of the Dryden Rubber Division plant at Keokuk, Iowa, recently voted to affiliate with the URW in a National Labor Relations Board election.

Decal for Rubber Products

American Decalcomania Co., Chicago, Ill., has developed a new type of decal for the marking or decoration of rubber products. Called the "Rubber-Cal," this new type decalcomania is said to provide maximum adherence to most types of rubber surfaces and can be effectively used to mark or decorate all types of rubber products. The Rubber-Cal can be printed in any number of colors and in any size shape or design, either open or with a solid background. Easily applied, the decal is highly durable, flexible, will not chip or peel, is abrasion resistant and washable. Immediate packaging after application of the decal is possible

Mansfield Names New Directors

Two vacancies on the board of directors of the Mansfield Tire & Rubber Co. have been filled with the election of Boyd Weaver, treasurer, and J. M. Slattery, director of purchases, to the posts. Mr. Slattery, widely known in the rubber industry, was associated with the U. S. Rubber Co. before joining Mansfield. The vacancies on the board of directors were caused by the death of George W. Stephens, chairman of the board, on August 12, and Charles Hoffman on March 29. Mr. Hoffman was the father of James H. Hoffman, present company president.

Moves Part of Operations

Mold-Craft Co. of Milwaukee, Wisc., has announced plans to move part of its operations from that city to Port Washington, Wisc. The firm makes three-dimensional display products of plastics and rubber. Robert A. Davies, treasurer, said that the A. C. Krueger Building Corp. has purchased a building in Port Washington, which Mold-Craft will lease. A. C. Krueger is executive vice-president of Mold-Craft. The two-story Port Washington building has 70,000 square feet of floor space. Company operations to be transferred to the new plant have not been indicated.

General Tire "Ko-Blend I.S."

Expanded facilities for the production of "Ko-Blend I.S.", a latex compounded masterbatch of insoluble sulfur, have been announced by the Chemical Division of the General Tire & Rubber Co., Akron, Ohio. Insoluble sulfur is necessary to control sulfur bloom in rubber stocks and, according to the company, tests have proved that Ko-Blend I. S., which contains 50 parts of 85% insoluble sulfur co-precipitated with 50 parts GR-S, provides a convenient and trouble-free means of incorporating sulfur into a wide range of rubber compounds. The product is recommended for light colored rubber products, white sidewall tires, carcass stocks, camelback, tire repair material, and nitrile rubber. Thorough testing has shown it to lessen danger of scorch, cut milling time, insure good dispersion, and assist in control of green tack. Ko-Blend I.S. is made by preparing a finely divided dispersion of insoluble sulfur in water. This dispersion is intimately mixed with a low viscosity GR-S-type latex, and the mixture is coagulated and dried under carefully controlled conditions. The resulting product is a dry crumb with fine particles of insoluble sulfur uniformly distributed and dispersed throughout the soft rubber mass.

Falls Engineering Expanding

Falls Engineering and Machine Co. of Cuyahoga Falls, Ohio, has discontinued its Mechanical Mold Department in order to expand its V-belt mold, V-belt equipment and special machinery production. William J. Hunt, formerly a partner in Falls Engineering, has established his own mechanical mold manufacturing business in Cuyahoga Falls and will service the former mechanical mold customers of Falls Engineering. Space formerly devoted to mechanical molds in the Falls Engineering building is now being used principally for special machinery production and for enginering and development offices of the Campbell Machinery Development Co. which designs all FEMCO-built machines. In line with the decision to emphasize V-belt molds, equipment and special machinery sales, Falls Engineering has announced the appointment of Louis P. Bokanyi, recently with William R. Thropp & Sons of Trenton, N. J., as sales manager of the company. James L. Hyatt, in charge of purchasing for Falls Engineering and a director of the company, has been elected secretary of the firm.

Reversible Furniture Cushion

A new foam reversible furniture cushion with scientifically designed flare which eliminates buckling of upholstery fabrics at corners, has been introduced to furniture manufacturers by the Restfoam Division of Hewitt-Robins Inc. The cushion, known as the "Restfoam Deluxe", also has a fine edge contour that permits smart tailoring, free of wrinkles, even when the covers are not cut exactly to pattern. The cushion will be available in various shapes and sizes to fit both modern and period furniture. The thickness is 3½ inches at the box and 5½ inches at the crown.

BRPRA REPORTS ON TECHNOLOGICAL ADVANCES MADE DURING 1951

A report covering its technical activities during 1951 has been issued by the British Rubber Producers' Research Association, Inc., which maintains headquarters at 19 Fenchurch St., London E. C. 3, England. The report covers scientific technology and rubber engineering, new materials, vulcanization, plasticization and aging, latex technology, and miscellaneous activities.

In the field of science, the report states that during 1951 theoretical studies of the elastic properties of rubber were made in terms of stored energy function. This describes mathematically the work needed to produce a given deformation of a piece of rubber. The stored energy function is made up of two parts, of which one has been shown to be determined by the degree of cross-linking of the rubber; i.e. by its state of cure. The second part has recently been shown to be closely related to the hysteresis of the rubber, and appears to be determined by the attractive forces between molecules.

The second part is of importance, because it represents the essential differences between the physical properties of natural and synthetic rubbers. When this part of the stored energy function is large, as it is with most types of synthetic rubber, the rubber is less resilient, and shows in consequence greater heat build-up when subjected to dynamic strain.

Rubber reinforced by textiles is, of course, widely used. It is obvious that under such circumstances its possible deformations are greatly restricted by the presence of the relatively inextensible textile fibers. The report states that a useful start has now been made in a quantitative treatment of the elastic properties of such a system.

Further progress has also been made in the understanding of the processes of tearing and abrasion. Previous studies have shown that continued abrasion of a piece of rubber by carborundum cloth produces a pattern very similar to that found on a worn tire. More detailed study of these patterns has led to important conclusions as to the way in which most of the wear of a tire occurs. When, in the course of each revolution of the wheel, a given portion of the tire makes contact with the road, the tread is squeezed out by the load of the vehicle, and this process involves the scraping of the tread surface over the road. It is here that most of the wear is now believed to occur.

Report on New Materials

The technical objective of the work described in this section of the report is to develop from natural rubber a range of new materials which will enter fields of application not previously open to it. The report goes on to say that the sharpest challenge to natural rubber presented by synthetic materials arises from the possible development of a range of products each excelling in one particular direction, e.g. in resistance to oils or to permeation by air.

This challenge can most effectively be met by developing a range of new materials from natural rubber. These materials will be harder than natural rubber, which in its pure vulcanized state is too soft for many practical purposes. Since there is a real commercial demand for materials which are strong, tough, and flexible, without necessarily being rubbery, the development of methods of stiffening natural rubber without serious loss of strength offers attractive possibilities of early exploitation on a substantial scale.

A limited degree of stiffening can be produced by incorporating hard inorganic fillers, but when these are used other properties are liable to suffer. Even the use of a reinforcing carbon black is attended by a number of disadvantages. Recently, attention has been turned to the partial or complete replacement of the usual fillers by hard organic polymers, such as polystyrene and polyvinyl chloride. BRPRA investigations have followed two lines, according to whether the polymer is simply mixed with the rubber or chemically combined.

Cyclized Rubber Used

Among the mixtures which have been studied, one of the most attractive involves the use of cyclized natural rubber as the stiffening agent. This possibility has been the subject of much work during 1951, in which BRPRA and Rubber Technical Developments, Ltd., have collaborated closely. (Rubber Technical Developments, Ltd., a research organization, is operated jointly by BRPRA and the British Rubber Development Board.)

Investigations have been based on the Dutch discovery that by reacting natural latex, suitably stabilized, with sulfuric acid, the rubber undergoes an intramolecular chemical change (cyclization) which converts it into a hard resin which still contains the whole of the original rubber hydrocarbon, with nothing added or removed. Mixtures of this material with further amounts of natural rubber have a range of properties, depending on their cyclized rubber content.

BRPRA Works Out Process

Starting from this observation, a process has been worked out by BRPRA and has been taken over by RTD and adapted to pilot plant production. Approximately a ton of material has already been made by RTD and distributed for evaluation. The principal application so far studied involves the use of a mixture of approximately equal parts of natural rubber and cyclized rubber for the production of shoe soles. An evaluation of the material for this purpose has been carried out by the British Boot, Shoe and Allied Trades Research Association, and also by a number of British firms concerned with the production of shoe soling materials.

The possible applications of rubber-polymer mixtures are not of course confined to shoe soling, the BRPRA report makes clear. Not only could other applications of leather be met by these products, but the possibility of a wide range of hardness opens wider fields. For many purposes it may well prove that other polymers are to be preferred to cyclized rubber. This possibility is under investigation and preliminary evaluations have been made in BRPRA laboratories of mixtures containing polymethylmethacrylate and polystyrene. The dynamic properties of some of these mixtures are outstandingly better than rubber compounds stiffened to the same extent with carbon black, which suggests that these mixtures may well find application where low hysteresis losses are needed.

An alternative method of incorporating polymers with natural rubber involves the production of the polymer in the presence of rubber. Catalyst systems have been worked out which enable methylmethacrylate or styrene to be polymerized in ammoniated latex. When this is carried out, some degree of reaction will occur between the growing polymer and the rubber.

Methods of analysis are now in the course of development which confirm this expectation. There is, therefore, reason to expect that the products may differ significantly in physical properties from those obtained by the simple admixture of polymer with rubber. The question as to which alternative is the more desirable in a particular case is a matter for future decision, and will involve problems of economics as well as of technical properties. Sufficient progress has already been made to encourage the commencement of pilot plant work by RTD.

Research on Vulcanization

With regard to vulcanization, BRPRA has been following the lines suggested by earlier fundamental researches and has been concentrating on peroxide methods. It has been found quite easy to use peroxide vulcanizing agents in a normal technological process, and a number of types of compound have been successfully made. No difficulty has been experienced in making pure gum compounds or a typical cable compound with a considerable loading of inorganic filler.

If a black compound is required, the choice of blacks is severely circumscribed, due to the fact that most types of black are found to decompose peroxides. Study of the properties of the peroxide vulcanizates is proceeding, and although outstanding results have not yet been achieved, it is thought that this method of vulcanization may ultimately find application. It is interesting to note that, by its aid, vulcanizates of quite outstandingly high transparency can be readily made.

In the field of sulfur vulcanization, attention has been devoted mainly to chemical and kinetic studies of the reaction of sulfur with simpler materials chemically related to rubber. The research objective here is to determine how sulfur vulcanization can be controlled so as to produce chemical structures which will confer desirable properties on the vulcanizate.

One possibility which has emerged from these researches is that of producing a sulfide cross-link and, at the same time, saturating the double bonds at the point of attachment of the sulfur. It is believed that structures of this kind are desirable from the point of view of obtaining vulcanizates of superior aging resistance. Present indications are that this type of structure can probably be obtained by the use of a vulcanizing agent based on sulfur

and an amine. This possibility is being pursued both technologically and in the chemical research department.

Plasticization and Aging

In the field of plasticization and aging, one of the most interesting developments during 1951 has been the elucidation of the mechanism of breakdown of rubber on a cold mill. It has been established that the actual process of breakdown occurs by a mechanical breakage of the long rubber molecules into shorter fragments. If this is done in nitrogen, however, the fragments recombine and the rubber remains hard. In the presence of air, the fragments become oxidized and their tendency to recombine is substantially reduced. It has now been shown that oxygen is not uniquely necessary in this process; a whole range of substances has been found which can operate in the same general way. From studies of polymerization, many substances are known which have the power of combining with free radicals, and these are found to be effective in promoting the softening of rubber by cold mastication in absence of air.

The outstanding importance of this work is considered to lie less in any application which may subsequently be made of these novel methods of plasticization than in the light it throws on the possibility of breaking rubber molecules by purely mechanical motion. The implications of this work for the investigations of other destructive processes, such as abrasion and tearing, are still under consideration.

Chemistry of Oxidation

It is noted in the report that a study of aging is of more importance in connection with vulcanized rubber than with the raw material, and consequently much attention was given in 1951 in extending oxidation investigations from hydrocarbons to organic sulfides. Chemical and kinetic studies were made of the reaction of the latter compounds with oxygen and with peroxides. The processes involved are exceedingly complex and will not easily be understood, the report states.

The important practical facts, however, are that the oxidizability characteristics of the sulfide differ markedly from those of hydrocarbons, and that it is becoming possible to trace a correlation between oxidizability and the type of sulfide unit present in various vulcanizates. Not only does this give a scientific reason for such well-known facts as the relatively poor aging properties of some types of vulcanizates, but it has enabled BRPRA to define chemical objectives for the vulcanization research. The structures which will be resistant to oxidative attack are being classified, and attempts made to develop vulcanization processes which give these structures.

Latex Technology

The fundamental research of the latex group during 1951 has been directed mainly to an investigation of some of the factors determining latex stability. The creaming characteristics and rates of coalescence of model emulsions of hydrocarbon oils, in the presence of soaps, proteins, zinc ammonium salts and water-soluble polymers, have been compared with the behavior of ammoniated latices containing the same compounds. The most immediate result of this work has been to throw further light on the zinc oxide stability of latex and the mode of action of organic heat-sensitizing agents.

Good progress has been made at the technical level in the development of new agents for the heat-sensitizing of latex. In collaboration with a firm of chemical suppliers, a range of polyglycols varying in composition and molecular weight has been prepared and tested. Excellent control of the heat-sensitizing efficiency of the compounds can be achieved. One compound has now been selected for general use and is being evaluated by RTD.

It is expected that if these final tests confirm laboratory indications, the material will shortly be offered for sale. Several other members of the range of polyglycols are also of possible interest in latex foam rubber production. At room temperature the stability of the foam is high and the possibility of premature gelation is negligible. Gelation and vulcanization of the latex foam is effected by a single heat treatment.

Impregnation of Leather

An investigation has also been started in cooperation with the British Leather Manufacturers' Research Association into the possibility of producing useful materials by the impregnation of leather with rubber latex. Investigation is still at the laboratory stage, but preliminary results indicate the possibility of securing a measure of deposition of rubber throughout the body of the leather. It is hoped in this way to strengthen the weaker portions of the leather, so as to increase its commercial value.

One of the factors likely to be important in impregnation problems is the particle size of the latex, and a method has been worked out in the laboratory for determining the average size of the latex particle. This is based on the replacement of the naturally-occurring coating of the latex particle by an alternative surface-active material. By measuring the amount of surface-active material required, the total surface areas of the particles, and hence their average size, can be calculated.

RTD has also been active in the further development of "Positex." Attention has been directed during 1951 to tests of socks which have been treated with Positex. Positex has been shown to produce a degree of shrink resistance comparable to that conferred by the normal chlorination process, and, additionally, to improve wear by reducing "pilling" and fiber shedding. The treatment does not affect adversely the comfort and general feel of the socks.

Other RTD Activities

In addition to those already mentioned with BRPRA researches, Rubber Technical Developments worked on a number of projects of its own during 1951. Some of these arose out of research work carried out by BRPRA, and others were initiated by RTD. Still others arose from inquiries or suggestions received from the British Rubber Development Board and outside sources.

One project of very long standing concerns the commercial exploitation of oxidized and depolymerized rubber. There was considerable interest in these during 1951, arising in particular from one firm who desired a special type not commercially available. RTD developed the necessary equipment and technique required for the manufacture of this material, and it is expected that further development will now proceed through normal commercial channels.

Methods of Proofing Fabrics

Another project arose from the development in America of a method of proofing fabrics with a specially compounded neoprene so as to produce waterproofing without serious impairment of vapor permeability. BRPRA had previously shown that the required properties could be obtained by means of natural rubber, and RTD has now carried this work a stage further by producing proofings, based on natural rubber, in sufficient quantity to enable service trials to be made. The results of these are now awaited.

There was also considerable interest during 1951 in the use of rubber molds for casting such materials as low-melting alloys. RTD was able to assist the interested firms in developing suitable natural rubber compounds for this purpose.

In addition to its major projects, RTD has carried on a considerable amount of small-scale manufacture, such as samples and prototypes prepared in answer to various inquiries. In order to make these varied activities possible, RTD is equipped to carry out on a semi-production basis all the normal rubber and latex manufacturing processes, as well as pilot plant chemical work such as is involved in the cyclization of rubber. The availability of this equipment has been of great benefit in facilitating the translation of laboratory developments into commercial production.

Our Traveling Public

Probably the reason that the United States uses more rubber than all the rest of the world put together is that Americans also own more than three-quarters of the world's automobiles, and about half the buses and trucks. A recent study made by the B. F. Goodrich Co. reveals that about 85% of the new rubber consumed in the United States goes into tires, tubes and other rubber products used on motor vehicles. Goodrich points out that 70% of this figure alone goes into tires and tubes. America consumed 1,214,000 long tons of new rubber last year, the study shows. What is more, the company estimates that by 1960 we will be using at least 1,600,000 long tons of new rubber in this country.

NAMES IN THE NEWS

HARVEY S. FIRESTONE, JR., chairman of the board of the Firestone Tire & Rubber Co., was recently honored in a resolution adopted by the House of Bishops at the 57th Triennial General Convention of the Protestant Episcopal Church for his services as chairman of the Presiding Bishop's Committee on Laymen's Work for a period of ten years.

STEPHEN T. ORR, vice-president of the Wyandotte Chemicals Corp., and for 25 years in charge of the company's manufacturing and operating activities, has been appointed a member of the president's staff with the rank of vice-president. FRANK WOLCOTT, formerly his assistant, succeeds Mr. Orr as general manager of the Michigan Alkali Division.

LAWRENCE E. GOODRICH has been named assistant sales manager of the Cycle Tire Department of U. S. Rubber succeeding KETCHEL F. MORLEN.

J. HARTLEY STACKHOUSE has been appointed sales and advertising manager of the Beebe Rubber Co., Nashua, N. H.

B. BEVERLY WRIGHT, formerly sales supervisor of the southwest division of the O'Sullivan Rubber Corp., has been appointed vice-president and sales manager of the Shoe Findings Division succeeding A. C. HALVOSA, who has resigned.

JOHN H. INGALLS, JR., formerly a sales representative for the Standard Service Bureau, Boston, Mass., has joined the sales staff of the Rubber Specialties Division, Dewey & Almy Chemical Co., where he will handle sales of meteorological balloons and rubber bladders.

ARTHUR F. MEDEIROS, associated with the Goodyear Tire & Rubber Co. for the past four years, has been appointed as staffman in cycle tire sales at Akron succeeding SANFORD BRYAN, who has been assigned to train for a store managership.

WILLIAM G. POTTS, formerly associated with the Plastics Machinery Section of the Engineering Department, National Rubber Machinery Co., has been transferred to the Plastics Machinery Sales Department of the company.

DR. W. E. KLEINICKE, associated with the Barrett Division, Allied Chemical & Dye Corp., for five years, has been appointed superintendent of the Shadyside Research Laboratory of the Barrett Division succeeding the late D. A. RANKIN.

G. E. YOQUELET, vice-president and treasurer of the Auburn Rubber Corp., has been named general manager of the company succeeding the late DAVID M. SELLEW.

GEORGE B. MOSELEY, associated with the Firestone Steel Products Co. since 1949, has been named general sales manager.

LEE R. JACKSON, president of the Firestone Tire & Rubber Co., was honored by fellow directors and other employees on his 40th anniversary with the company on September 3.

LESTER D. KOCH, vice-president of the Witco Chemical Co., has been appointed eastern sales manager of the company. He will continue to supervise the operations of the Export-Import Department as in the past.

MARVIN HUFFMAN, associated with the Goodyear Tire & Rubber Co. since 1940, has been appointed acting superintendent of tire production in Plant 2 in Akron succeeding VAL FOLLO, who has been named factory manager of the Goodyear Aircraft Corp.

GERMAN C. FLICK, associated with the U. S. Rubber Co. since April, 1951, has been named sales manager of its decorative plastic topping material "Satusply" and of its plastic wall covering, "Naugawall."

DAVID L. FLANDERS, associated with the B. F. Goodrich Co. since 1937, has been named manager of purchasing, textiles, advertising and paper products.

LESLIE D. CARVER, director of technical service for the Carbon Black Division of the Witco Chemical Co., has gone abroad for approximately two months to visit various branches and agencies of the company throughout Europe.

AMES B. HETTRICK, formerly assistant manager of manufacturing for the Calco Chemical Division of the American Cyanamid Co., has been named manager of the newly-formed Calco Engineering and Development Department of the Division.

R. S. WILSON, vice-president in charge of sales for the Goodyear Tire & Rubber Co., was recently presented with a gold lapel pin by the company marking his completion of 40 years' service with Goodyear.

FORREST W. BUCK, JR., formerly associated with the Technical Service Department of the Columbia-Southern Chemical Corp. at Barberton, Ohio, has been named sales representative in the New York area with headquarters at the firm's New York office.

FRANK WALSH, formerly associated with Merck & Co., Inc., has been named sales representative for the Middle Atlantic Regions for the Baker Castor Oil Co. He will maintain headquarters in Philadelphia, Penna.

Baird Elected Vice-President

Robert B. Baird, secretary of the Baird Rubber & Trading Co., New York, N. Y., has been elected a vice-president of the firm. Mr. Baird joined the company in 1948, after having been with the Acme-Hamilton Manufacturing Corp. for two years. He was named secretary and director of Baird Rubber in December, 1948.

ROBERT STEWART has been named vice-president in charge of sales for the Plastic Coating Division of the Jamestown Finishing Products Co., Jamestown, N. Y.

RAYMOND A. NASH, director of manufacturing for the Industrial Tape Corp., New Brunswick, N. J., has been elected a director of the company.

ROBERT A. BADENHOP of the Robert Badenhop Corp., New York, N. Y., has accepted the chairmanship of the Rubber Division in the 1952 fund raising drive of the Travelers Aid Society of New York.

ROBERT MORAN, associated with the General Tire & Rubber Co. since 1936, has been named manager of the Special Purpose Tire Department. DAVID G. GEHRING, associated with the company since 1931, has been named to succeed Mr. Moran in the handling of replacement sales in industrial tires. He will also continue to handle replacement sales of farm tractor and implement tires.

SIDNEY D. KIRKPATRICK, editorial director of *Chemical Engineering* and *Chemical Week*, and vice-president and director of editorial development of the McGraw-Hill Book Co., Inc., was named an honorary member of the American Institute of Chemists at the October 9th meeting in New York City.

EDWARD W. MCCARTHY, formerly assistant technical director for Vulcan Rubber Products, Inc., has been appointed chief chemist for Chemical Rubber Products, Inc., Brooklyn, N. Y.

PHILIP CAMBERG, until recently associated with the Koppers Co., is now rubber technologist in the materials Branch of the Engineer Research and Development Center of the U. S. Army at Fort Belvoir, Virginia.

GEORGE R. WAITKINS, formerly associated with the Calco Chemical Division of American Cyanamid Co., has joined the St. Louis Research Department of the American Zinc, Lead & Smelting Co. at Kirkwood, Missouri, as assistant manager.

WILLIAM B. GUFFEY, associated with the Traffic Department of the United Engineering and Foundry Co. since 1939, has been named traffic manager succeeding LEONARD G. HULTS.

L. F. REIMANN, associated with the Jackson & Church Co., Saginaw, Mich., for the past 27 years, has been named assistant vice-president of manufacturing.

Fabel Named Thermoid President

George S. Fabel

George S. Fabel, formerly vice-president of the Thermoid Co., Trenton, N. J., has been elected president succeeding Fred E. Schluter, who remains on the board of directors. Mr. Schluter resigned the presidency in order to devote more time to outside interests. Mr. Fabel has been with Thermoid for over 30 years. His first job was in the factory in the Molded Rubber Goods Department. After holding several supervisory jobs in the factory, he transferred to sales, where he was associated with both the Automotive Replacement and Industrial Rubber Divisions. In 1930, Mr. Fabel was appointed vice-president and general manager of the Southern Asbestos Co., a Thermoid subsidiary at Charlotte, N. C. He was later named president of Southern Asbestos and became a director of Thermoid in 1939. He was elected a vice-president of the company last spring. Mr. Fabel has served as president of the Asbestos Textile Institute, of which he is presently vice-president.

Narragansett Answers Charges

Answers have been filed by two wire-making companies to National Production Authority charges that they falsified copper allocations. An NPA spokesman said the agency contends the Texas Wire & Cable Co. of Dallas, Texas, was organized by the Narragansett Wire Co. of Pawtucket, R. I., to obtain more copper allocations for the latter. The Texas company has filed a direct denial to the fifty-two charge. Narragansett's answer has not been disclosed, although the company has filed a motion for a bill of particulars.

Georgia Marble Names Agent

The Calcium Products Division of the Georgia Marble Co., Tate, Ga., has announced the appointment of Anderson & Co., 547 Aqueduct St., Akron 3, Ohio, as sales representative for the company. The Anderson company will call on the plastics and paint trade in the Akron area in the interest of calcium carbonates produced by Georgia Marble.

FTC Charges Price Discrimination

Price discrimination based on volume of purchases by their customers was charged to four manufacturers of rubber heels, soles and other shoe repair products on September 21 by the Federal Trade Commission. The concerns and the dates set for hearings on the separate complaints are as follows: American Biltrite Rubber Co., Inc., Chelsea, Mass., December 1 in Boston, Mass.; B. F. Goodrich Rubber Co., November 18 in Akron; Goodyear Tire & Rubber Co., November 20 in Akron; and the O'Sullivan Rubber Corp., Winchester, Va., November 25 at Winchester. The complaint says the discounts of goods are cumulative, based on the total amount of goods purchased by a customer within a year. It adds that the effect is substantially lower prices than are charged less favored customers, tending to promote monopoly. FTC charged that American Biltrite's discounts range from none on purchases of less than $3,000 to 5% on more than $35,000 yearly. For Goodrich, it says the schedule ranges from none on purchases of $499 to 10% above $5,000. It says Goodyear's range is from none on purchases under $5,000 to 6½% above $100,000. O'Sullivan's spread is from no discount below $3,000 to 17½% above $400,000, FTC states. In replying to the charge, an American Biltrite official stated that his firm was "following competition in the trade" in its discount practices.

RFC Announces OSR Changes

The following personnel changes have taken place in the Research and Development Division of the Office of Synthetic Rubber, Reconstruction Finance Corporation:

Carl W. Gay has resigned as assistant chief of the Research and Development Division and returned to employment with the Goodyear Tire & Rubber Co.

Thomas H. Swan, formerly head of the Polymer Research Section, has been promoted to assistant chief of the Research and Development Division.

Arthur L. Hollis has been named chief of the Polymer Science Branch, which combines the Polymer Research and Polymer Development Sections.

Alfred M. Anisman has been transferred to the Polymer Science Branch from the Plant Operations Branch.

R. M. Clibourn, F. McClelland and Maurice H. Whitlock have been transferred to the Applied Development Branch from the Plant Operations Branch.

Puerto Rican Factory Planned

U. S. Rubber International Corp. has concluded negotiations with the Puerto Rico Industrial Development Corp., for a new factory site and building in Bayamon, Puerto Rico, for the manufacture of a new type of canvas and rubber shoe. The development corporation will provide U. S. Rubber International Corp. with a building of 23,000 square feet and a site of 4½ acres. Initial operation of the plant will be of pilot character. The new plant is another successful advance in the industrialization program sponsored by the Puerto Rico Industrial Development Corp.

Castle Rubber Names Kaltenbaugh

Mabel Kaltenbaugh

At a recent meeting of the board of directors of the Castle Rubber Co., East Butler, Penna., Miss Mabel Kaltenbaugh was elected secretary-treasurer of the company. Miss Kaltenbaugh has been with the company for over nineteen years, having joined the firm upon being graduated from Butler Business College. She succeeds N. E. Brown, who recently retired from the company. Mr. Brown had been secretary-treasurer of the company from its founding in 1922.

Goodyear Producing New Life Raft

Goodyear Tire & Rubber Co. is producing a 20-man life raft for the United States Air Force. The new raft is designed to be carried in air transports. Automatically inflated by carbon dioxide, the raft can be inflated and ready for use within approximately 30 seconds. Circular in design, it is identical on top and bottom and therefore can be boarded regardless of which side turns up in the water. It weighs 108 pounds and measures only 36 by 18 by 18 inches in its carrying case. One of the unusual features of the raft is a portable nylon canopy which can be attached easily to the outer edge of the raft. The canopy has two port holes and is fitted with an elastic lining at the bottom which fits snugly to the side of the raft. Reversible, the canopy is camouflaged greenish-blue on one side and colored a brilliant neon red on the other for signalling purposes. Provision is made for attaching a radar reflector to the canopy's mast. Made of nylon fabric with rubber coating, the raft has withstood rigid tests by Goodyear and the U. S. Air Force.

Opens New York Sales Office

Federal Products Corp. of Providence, R. I., has opened a new branch sales office at 1018 Stuyvesant Avenue, Union, N. J., to serve the greater New York City area. The new office replaces the F. A. Brady Co., which formerly served as manufacturers' representative. The new Federal Products branch office will be under the management of James G. Gunderson, associated with the firm for the past 13 years. Robert A. Powell will also work out of the new office.

Armstrong Develops New Process

New paper products containing cork and treated with rubber or resin have been developed by the Felt and Fibrous Products Department of the Armstrong Cork Co. using an entirely new manufacturing process. These materials are intended for use as improved replacements for present felt or board materials and as potential substitutes for other more expensive materials. Some of the new boards and their potential uses include CS-402-A, a thermoplastic material that can be embossed under heat and pressure, that lends itself to possible application in the automotive, furniture, railway car, luggage, and novelty and game manufacturing industries; CS-404, a material with a good cushion effect that can be made in dark and light colors and is especially applicable to the handbag and leather goods trade and as a backer for coated products where cushion is a factor; CS-405, a low-priced material that may be used where current papers are not quite sufficiently strong or where special requirements call for better than average water resistance; CS-403, a material of high tensile strength either wet or dry, that may be used by the leather goods trade as a plumping material and by the handbag trade; and CS-406, a tough and highly flexible product that can be shaped and formed under heat and pressure.

These new products can be made in a wide variety of calipers and densities so as to embody specific qualities for specific jobs. The new materials, manufactured by a patented modification of what is called the "beater-saturation process," are the result of Armstrong's long development program to produce new fiber materials with entirely new characteristics and qualities. The beater-saturation method employed by Armstrong treats the fibers with water dispersions of rubber or resin, thus distributing an even coat over each fiber before the sheet is formed, resulting in a sheet of homongeneous quality. The new treated felts have high compressibility, combined with high crush resistance, imperviousness, flexibility, uniformity, and other characteristics unique in this type of material.

Expands Gen-Tac Latex Facilities

The Chemical Division of the General Tire & Rubber Co. has expanded facilities for the manufacture of Gen-Tac Latex, a vinyl pyridine latex which is said to enhance the adhesion between rubber and rayon or nylon. While the company has been supplying this product in limited quantities, this new production capacity will permit an expansion of business and wider distribution of the product. The company reports that rayon and nylon tires, V-belts, hose, conveyor belts and inflatable rubber products have all been improved through the use of this product. Field tests have shown that the greater adhesion obtained through the proper use of Gen-Tac Latex dips results in improved fatigue resistance and fewer ply separations in service. Extensive use has also indicated that Gen-Tac Latex dips reduce curing blows, minimize pick down, lower scrap fabric losses, improve dip processing, and lessen squeeze roll build up.

FINANCIAL NEWS

Firestone Tire & Rubber Co.

Nine Months Ended July 31: Estimated net income of $29,099,954, after providing a reserve of $9,543,000 for earnings of certain foreign subsidiaries which cannot now be remitted. The net is equivalent to $7.35 a share, compared with $33,473,195, or $8.47 a share, for the nine months to July 31, 1951. A reserve of $9,675,000 for unremitted profit of certain foreign subsidiaries was provided in that period. Sales of the company and its subsidiaries in the nine months ended July 31, 1952 amounted to $699,129,079, an increase of 1.4% over the $689,600,136 for the nine months of the prior year.

Parker Appliance Co.

Year Ended June 30: Consolidated net income of $834,257, which is equal to $2.58 a share, compared with $577,953, or $1.79 a share, in the preceding fiscal year. Sales in the year ended June 30, 1952, amounted to $21,879,316, contrasted with $12,201,432 in the previous fiscal year.

Dayton Rubber Co.

Nine Months Ended July 31, 1952: Net profit of $1,134,357, which is equal to $1.96 per share of common stock. Net sales in the nine-month period totaled $38,354,364. No comparisons are available as this is the first time the company has released a nine months' earning report.

Lea Fabrics, Inc.

Year to May 31: Net profit of $453,062, which is equal to $2.16 a share, compared with $672,408, or $3.20 a share, in the previous fiscal year.

Goodyear Pliovic G9OV

Introduction of the first in a new series of Pliovic polyvinyl chloride resins has been announced by the Chemical Division of the Goodyear Tire & Rubber Co. Designated "Pliovic G9OV," the new resin is described as a general purpose, straight vinyl material having an approximate intrinsic viscosity of 0.90. Its outstanding thermal stability is the basis for its recommendation for universal use in calendering, extruding, injection molding and conventional molding of vinyl materials. Both clear and pigmented products are said to benefit from the excellent light stability and good color of the resin. The product also has a high bulk density for ease of handling and easy interchangeability with other resins. The new product is expected to find its most extensive application in calendering of both vinyl film and sheeting for rainwear, draperies, upholstery and similar materials. Plant trials and laboratory tests have demonstrated that products made with Pliovic G9OV exhibit low water absorption, relatively good flexibility at low temperatures, and other desirable physical characteristics.

Goodyear To Run Atomic Plant

The Atomic Energy Commission has announced the selection of the Goodyear Tire & Rubber Co. as operating contractor for its uranium-235 plant soon to be built in Pike County, Ohio, between Portsmouth and Chillicothe. When the $1,219,000,000 facility is completed some four years hence, Goodyear will be the principal employer there with a permanent working force of about 4,000 persons. Goodyear will put individual units of the gaseous diffusion plant into operation as they are completed. All operating employees will undergo an extensive training program so that some hiring of permanent personnel will probably begin early next year. In assuming this operation, Goodyear officials will work closely with the Union Carbide and Carbon Corp., operating contractor for the gaseous diffusion plants at Oak Ridge, Tenn., and Paducah, Ky. Union Carbide will also assist in the training of key personnel employed by Goodyear. Goodyear has announced initial key assignments for the plant, with Albert J. Gracia, formerly assistant manager of research and development as manager of operations. James A. Merrill, with Goodyear for 22 years, has been named manager of laboratories, while D. H. Francis has been appointed manager of development engineering. George H. Reynolds has been named manager of production, and W. A. Brown has been placed in charge of plant engineering and maintenance. Hugh C. Hilliard will handle industrial relations, H. H. Kenny will handle finance, while I. S. Gharky will handle purchasing and materials.

Ground Grip Open Center Tire

A new farm tire for rear wheels of tractors that will speed up farm work and cut operating costs has been announced by the Firestone Tire & Rubber Co. Company officials point out that the new tire has been built of the highest quality materials and the finest quality compounds to resist weather and aging. The new rear traction tire, known as the "Ground Grip Open Center," is said to be the only one in its field with a double-thick base at the end of the center bars. The tire also has two extra tread plies for added protection against impact breaks and is the only low-priced, curved-bar, open-center tire available to farmers. The tapered bar construction gives a sharp bite at the center and maximum penetration at the shoulder for greater traction, the company states.

Develops New O-Ring Compound

Precision Rubber Products Corp. of Dayton, Ohio, has announced development of a new compound for O-rings which is unaffected by the new synthetic lubricants used in jet aircraft. Called "Compound 142-70", the new formulation meets military specifications covering rubber products suitable for synthetic oil resistant requirements. In addition, several manufacturers of jet engines and auxiliary equipment have approved this material against their own particular specifications for synthetic lubricant service.

LOS ANGELES NEWS

The October 7th meeting of the Los Angeles Rubber Group was to have a paper by George M. Konkle of the Dow Chemical Co. entitled "Recent Developments in Silastics." A report on this paper will appear in a future issue of RUBBER AGE. The non-technical session was to have been addressed by Dr. Carlton C. Rodee, professor of political science at the University of Southern California. Dr. Rodee's paper was entitled "What we Don't Know is Likely to Hurt Us."

John Ryan, assistant editor of *TLARGI News*, has been transferred to the Gadsden, Ala., plant of the Goodyear Tire & Rubber Co. as chief chemist.

Marvin Moon of the Tri-Angle Tool and Machine Co., has announced the opening of a new plant and offices at 8623 Dice Road, Los Nietos, Calif.

Charles Evans has been named works manager of the Downey, Calif., plant of the Arrowhead Rubber Co.

Ray Hansell, formerly associated with Fargo Rubber, has been named vice-president of the Chemical-Proof Corp. of Los Angeles. A new plant is nearing completion in Downey, Calif., and will house an electrically heated and electronically controlled oven and the latest type blasting equipment. Chemical-Proof Corp. of Los Angeles is associated with Chemical-Proof Construction, Inc. of San Francisco and Seattle, who hold the western franchise on sales and application of "GACO" neoprene and rubber linings and coatings. The Downey facility will be equipped to apply natural and synthetic sheet rubbers, liquid neoprenes, vinyls and phenolics for plant or field applications.

John H. McSparran, formerly associated with the C. P. Hall Co., has been named sales manager for the Durethene Corp., servicing accounts west of the Rockies.

National Foam Rubber Corp., formerly located at 2124 East 51st St., Vernon, Calif., may now be addressed at 424 Roosevelt Avenue, Montebello, Calif. The company's new plant is now in operation specializing in foam rubber mattresses.

Master Processing Corp., Lynwood, Calif., has purchased 1¼ acres adjacent to its present property where it plans to construct a new unit to house a Banbury. The new facilities will be used to mix colored stocks for manufacturers.

A new headquarters for the Western Division of Hewitt-Robins Inc. was scheduled to open in early October in Los Angeles. A new one-story building, with 13,000 square feet of floor space, has been constructed at 2533 Malt Avenue. The new building will provide offices for sales and engineering personnel and warehouse space for belting, hose and conveyor equipment.

The first western experiment in the use of natural rubber in streets and highways began recently in Los Angeles. City crews began laying 2,200 square yards of rubber-asphalt mixture at the intersection of Figueroa St. and Venice Blvd. Harry K. Fisher, consulting engineer for the Natural Rubber Bureau, Washington, D. C., acted as consultant to the Los Angeles Street Maintenance Bureau for the project. The rubber-asphalt mixture used contained a 5 to 7% rubber powder added to the asphalt.

On October 8, the basic course in rubber technology sponsored by the Los Angeles Rubber Group at the University of Southern California, began. Lectures and discussions have been scheduled on natural and synthetic rubbers, physical properties and testing, compounding, processing, molding, vulcanizing, tires and inner tubes, design and compounding, Silastics, adhesives, foam sponge, hard rubber, general administration, sales, cost accounting and estimating, and production and material control. Two field trips have also been scheduled.

Earl Hales, formerly associated with Arrowhead Rubber, has been named sales manager for the Plastic and Rubber Products Co.

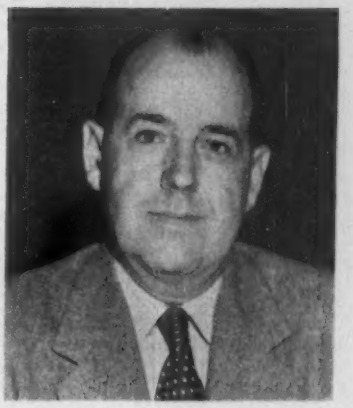
Buys Gum and Wax Departments

Morningstar, Nicol, Inc., New York, N. Y., has acquired the Jersey City, N. J., plant and three departments of Innis, Speiden & Co. The three units involved were the Natural Gums, Wax and Absorption Base Departments. The company has arranged for the transfer of the Wax Department to the Frank B. Ross Co., Inc. of Jersey City, N. J., but for the time being they will continue to process the waxes formerly made by Innis, Speiden until the Ross company can absorb the manufacture in their own plant. The purchase price of the departments and plant was not disclosed.

Triangle to Make New Plastic Piping

Triangle Conduit & Cable Co., New Brunswick, N. J., has announced that it shortly will be making flexible and semi-rigid polyvinyl chloride and butyrate plastic piping. A new unit, the Plastics Products Division, has been set up to handle the company's expansion into the plastics field. It was also announced that rigid and high impact plastic pipe will be produced by the firm at a later date. All four types will be made in the company's new plant in New Brunswick, N. J. Judd E. Winick has been named manager of the new division.

U. S. Rubber Names Miller



Purdy Miller

Purdy Miller has been appointed manager of molded goods sales for the Mechanical Goods Division of the U. S. Rubber Co. Mr. Miller will make his headquarters in Passaic, N. J. He was formerly assistant manager of the Chicago branch and has had many years of experience in sales and branch management.

Join Naugatuck Chemical Division

Lawrence W. Widdecombe, Jr., and Harold Spector have joined the Colloidal Products Development Section of the Naugatuck Chemical Division, U. S. Rubber Co. Mr. Widdecombe will have charge of the paint laboratory, supervising research and technical service work on latex paints. A former employee of the Murale Co., Haskel, N. J., he is a graduate of Wagner College. He is a member of the New York Paint and Varnish Production Club. Mr. Spector will direct the division's paper laboratory, supervising research on applications of plastics latices in the paper industry. He is a graduate of the University of Saskatchewan, Canada, and was formerly employed in product development work on paper and paper board specialties by the St. Regis Paper Co., Watertown, N. Y.

Boston Woven Hose Promotions

The promotion of H. S. Johnson to director of merchandising, L. M. Atwood to assistant general sales manager and J. H. Alsen to director of engineering applications of the Boston Woven Hose & Rubber Co., Cambridge, Mass., was recently announced. Mr. Johnson has been with the company since 1936. He will direct the activities of the home office sales organization including advertising, sales promotion and market research. Mr. Atwood will have responsibility for the company's general line field sales force. He joined the company in 1948 as western manager of the V-Belt Department. Mr. Alsen has held a number of positions since joining the company in 1920, and in his new post will be responsible for the application and sale of the company's products to original equipment manufacturers.

Anolith Color-Transfer Process

A one-operation process for transferring multi-colored printed impressions from paper to rubber or plastics has been announced by American Anode, Inc., a division of the B. F. Goodrich Co. The new ink transfer process, called "Anolith", permits true reproduction of 300-screen halftones in color. Dr. R. V. Yohe, president of American Anode, explained that a separate printed label, on a type of paper in common use as magazine stock, is required for each transfer. No special printing ink is needed. The transferred image will last as long as the surface of the rubber, he said, because a slight curing operation permanently seals the impression. Tests show that multi-colored impressions transferred by this process remain brilliant and sharp, he added. Dr. Yohe stated that the Anolith process opens the door to a vast field of commercial applications such as various sidewall color combinations for tires, drapery patterns for vinyl sheeting, imprinting of conveyor belting and rubber matting, sundries items and recreational items. Colored impressions can readily be transferred to black rubber stock. Exclusive rights to the method have been granted to American Anode by the Soledad Co. of Los Angeles, Calif., holder of the patent rights. American Anode also has the right to sub-license the process.

Named Heyden Board Chairman

John P. Remensnyder, formerly president of the Heyden Chemical Corp., has been elected to the newly-created office of chairman of the board. Simon Askin, previously vice-president in charge of industrial relations and purchasing, has been elected president of the firm succeeding Mr. Remensnyder. Both Mr. Remensnyder and Mr. Askin are directors of the company. Barrett Brown, partner in R. W. Pressprich & Co., was elected a director of the company succeeding Dr. Donald B. Keyes, who has resigned. Mr. Remensnyder, who has been associated with Heyden for over 32 years, became president in January, 1950 and served as vice-president of the corporation from 1944 to 1950. Mr. Remensnyder is chairman of the board and a director of St. Maurice Chemicals, Ltd. Mr. Askin also has served as president of the American Plastics Corp., a Heyden subsidiary, since 1948. Mr. Askin also is treasurer and director of St. Maurice Chemicals, Ltd. of Montreal.

Organizes Foreign Department

Pittsburgh Coke and Chemical Co., Pittsburgh, Penna., has organized a Foreign Department to direct all its overseas chemical sales operations. Headquarters of the new department will be in the Empire State Building in New York City. The appointment of two key men in the new department was also announced. Robert Kirk, for the past six years export manager for the Chemical Division of McKesson & Robbins, Inc., has been named manager of the new Foreign Department. Sales manager of the Foreign Department will be David H. Hoyer, who has directed the export sales of agricultural chemicals for Pittsburgh Coke since 1948.

CANADIAN NEWS

The recent U. S. District Court Ruling, ordering E. I. du Pont de Nemours & Co., Inc., and Imperial Chemical Industries, Ltd., to end their joint partnership in British and Canadian companies, and particularly in Canadian Industries, Ltd., continues to arouse strong public resentment and criticism in Canada. As reported in the September issue of RUBBER AGE, many Canadians see in the U. S. court decision an attack upon Canadian sovereignty. It is asked what jurisdiction a U. S. court has on a Canadian company. Complete details on the U. S. court order will be found elsewhere in this issue.

The appointment of Fraser A. Muter as Ontario District manager of industrial products sales for the B. F. Goodrich Rubber Co. of Canada Ltd., was recently announced by H. P. Hawkins, general manager of the Industrial Products Sales Division of the company. Mr. Muter has been associated with B. F. Goodrich since 1934 and prior to this appointment was special representative to the Ontario Electrical Appliance Manufacturers. Howard Janke, formerly industrial products representative for Hamilton and Niagara Peninsula, has taken over Mr. Muter's responsibilities.

M. O. Simpson, president of Gutta Percha & Rubber, Ltd., addressing the ninth annual meeting of the company's 25-Year Club held recently in Toronto, told the guests that the company is undertaking an aggressive program of modernization and development of new products. Simultaneous meetings of the club's 350 members were also held in Vancouver, Edmonton, Winnipeg, Montreal, Halifax, and London, where Gutta Percha has branch offices and warehouses. Forty percent of the company's active employees have been with the firm for 25 years or more.

St. Maurice Chemicals Ltd. of Montreal, the Canadian company formed jointly by Heyden Chemical Corp. and Shawinigan Chemicals, Ltd., subsidiary of the Shawinigan Water and Power Co., will complete construction early in 1953 of the new plant at Varennes, Quebec, with capacity to manufacture 30,000,000 pounds of formaldehyde and 3 million pounds of pentaerythritol, the first commercial production in Canada of this solid alcohol which is the base for the new quick-drying, weather-resistant paints, varnishes and lacquers.

The 17-week strike at the Firestone Tire & Rubber Co. plant at Hamilton, Ont., was recently settled after a 16-hour marathon session between representatives of the company and URW Local 113. A spokesman for the union said that the strike had been settled to the union members' satisfaction. The strike began on June 3rd and involved 1,400 workers.

Loses Inflatable Bra Case

A requested injunction to stop production of inflatable brassieres at the plant of the La Resista Corset Co., of Bridgeport, Conn., was recently refused by a superior court judge in Hartford. The order was sought by Mrs. Marie Smith, owner of the Anchor Rubber Co. of Orange, Conn., who charged that the inflatable brassiere being made by La Resista is an invention of James R. Van Buren, one of her employees. The plaintiff charged that Mr. Van Buren had developed an inflatable tube with a self-closing valve at La Resista's request, but that the latter company had then failed to pay $16,000 compensation to Mr. Van Buren and had applied for patents on the invention. Damages of $575,000 were requested since Anchor Rubber had been denied an exclusive distributing contract. In its reply, La Resista said the inflatable bra was perfected only after it suggested the use of plastic rather than rubber in the pneumatic filling. It further contended that under the law any invention is vested in the firm employing the person to do the work. In the rulling, the court held that "an injunction ought not to be granted except for the prevention of serious and irreparable injury," adding that an injunction is never demandable "as a matter of right."

More Certificates of Necessity

The Defense Production Administration has issued a new list of approved Certificates of Necessity for accelerated tax amortization on new or expanded defense facilities. Certificates issued recently include:

B. F. Goodrich Chemical Co., Louisville, Ky., $163,000 for nitrile rubber.

General Cable Corp., Perth Amboy, N. J., $2,350,000 for cable for military use.

U. S. Rubber Co., Fort Wayne, Ind., $347,578 for abrasive products; and $58,563 for military tires at Detroit, Mich.

Industrial Tape Corp., Elkhart, Ind., $3,272,330 for industrial pressure sensitive tape.

Plastoid Corp., Hamburg, N. J., $23,160 for plastic insulated wire; and $52,295, also for plastic insulated wire.

Continental Oil Black Co., Westlake, La., $1,646,500 for carbon black.

Faultless Elects Officers

The board of directors of the Faultless Rubber Co., meeting in Ashland, Ohio on September 26, elected T. W. Miller, Jr., president of the company. George A. Meiler was elected vice-president and treasurer, while Western Wiles was elected vice-president in charge of sales. John G. Roppel was named vice-president in charge of manufacturing and N. R. Duell named vice-president in charge of planning and procurement. Charles W. Ebert was elected secretary and assistant treasurer and R. L. Charlton was elected assistant treasurer. R. C. Johnson was elected assistant secretary. At a stockholders' meeting held prior to the directors' meeting, the Messrs. Duell, Meiler, Miller and Wiles, together with Curtiss Ginn, Jr., C. D. Hubler and W. A. McAfee were elected to the board of directors.

LEADING SUPPLIERS TO THE RUBBER, PLASTICS AND ALLIED INDUSTRIES ·

OBITUARIES

Frederick L. Curtis

Frederick L. Curtis, retired vice-president of Raybestos-Manhattan, Inc., and former general manager of the Manhattan Rubber Division plant in Passaic, N. J., died in that city on September 20. He was 84 years old. Mr. Curtis began a 70-year career in the rubber industry with the New York Belting & Packing Co. of Newtown, Conn. He came to Passaic in 1893 to help establish the Manhattan Rubber Manufacturing Co., which later became a part of Raybestos-Manhattan. He was the last original employee of the Manhattan Rubber Manufacturing Co., which he had served as general manager and treasurer. When Mr. Curtis retired from active service with Raybestos-Manhattan four years ago, the company named him an honorary director. Mr. Curtis was an organizer of the Manhattan Securities Co., which controls a rubber plantation in Java, and a part owner of the New Jersey Engineering and Supply Co. of Passaic. Funeral services were held on September 22 in Passaic, with interment in Newtown Cemetery. Mr. Curtis never married. He leaves a brother.

John R. Lotze

John R. Lotze, manager of passenger tire and sealed-air tube sales for the Seiberling Rubber Co., died on September 2 in St. Thomas Hospital, Akron, Ohio. He was 55 years old. A native of Trenton, N. J., Mr. Lotze had been in the rubber business for more than 28 years. Between 1916 and 1924, he held various sales assignments with the Firestone Tire & Rubber Co. and the General Tire & Rubber Co. In 1924 he formed a retail tire dealership in Canton, Ohio, and from 1930 to 1942 was president of the Safety Tire Co., Youngstown, Ohio. He came to Seiberling in 1946 and began work in the Merchandising Department. He was manager of dealer development and later became merchandising manager before being promoted to manager of passenger tire and sealed-air tube sales in July, 1949. During World War II, Mr. Lotze served as a lieutenant colonel in the Air Force. He served as a naval officer during World War I. Burial services were held in Holy Cross Cemetery, Akron. He is survived by his wife and six children.

Frank Birdsall

Frank Birdsall, factory manager of the Olympic Tyre & Rubber Co., Ltd., Melbourne, Australia, passed away on August 1st of bronchial pneumonia. Mr. Birdsall was one of the first to engage in the manufacture of pneumatic tires in Australia and was important in the founding of Olympic Tyre. In 1946, Mr. Birdsall visited many people in the American rubber industry during a trip to the United States.

Donald A. Rankin

Donald A. Rankin, superintendent of the Shadyside Research Laboratory at Edgewater, N. J., for the Barrett division of the Allied Chemical & Dye Corp., died on September 19. He was 46 years old. Born in Fitchburg, Mass., Mr. Rankin was graduated from Harvard University in 1927 with a B.S. degree. After his college education, he joined E. I. du Pont de Nemours & Co., Inc. In 1934, he joined the Barrett Division. From 1944 until his death, Mr. Rankin was superintendent of the Shadyside Research Laboratory, where he had recently supervised construction of the new Applications Research Laboratory, as reported in the September, 1952 issue of RUBBER AGE. Mr. Rankin was a Fellow American Institute of Chemists and a member of the American Chemical Society. He was the author of a number of patents issued in his field of work. Surviving are his wife and two children.

William H. Dunn

William H. Dunn, retired treasurer and director of Raybestos-Manhattan, Inc., died on September 29 at his home in South Orange, N. J. He was 69 years old. Mr. Dunn was born in New York and was graduated from the College of the City of New York. He joined the staff of Price, Waterhouse & Co., handling the account of the former Manhattan Rubber Manufacturing Co. In 1916, Mr. Dunn joined Manhattan Rubber as comptroller. He became a member of the executive committee in 1937 and a member of the board of directors in 1939. He retired as treasurer and director in 1950. Mr. Dunn was also a former treasurer of the Rubber Manufacturers' Association and of the Friction Material Institute. During World War I, he was consulting accountant for the Treasury Department in Washington.

Julio Arana

Julio Arana, known in the early 1900's as the "rubber king", died on September 11 in Lima, Peru. He was 84 years old. Mr. Arana once owned great tracks of Peruvian wilds along the northeastern frontier. He lost his fortune when his tracts—a principal source of the world's rubber—failed to meet the competition of British and Dutch plantations in Malaya and the Far East.

Carl Pharis

Carl Pharis, founder and president of the former Pharis Tire & Rubber Co. of Newark, Ohio, died on September 7 in Columbus, Ohio, after a short illness. He was 70 years old. A native of Johnsville, Ohio, Mr. Pharis had been retired from business for the past five years. Pharis Tire went out of business in 1948.

Otho J. De Lon

Otho J. De Lon, sales representative for the Industrial Chemicals Division of the American Cyanamid Co. in the Chicago District, died suddenly on Septemer 19 at Kokomo, Ind. Mr. De Lon joined American Cyanamid in 1929 when the Kalbfleisch Corp. was acquired by the company. He was appointed a sales representative for the Industrial Chemicals Division in 1932, and served in that capacity until his death. Funeral services were held on September 22 in Kokomo.

Carbon Black Research Grant

Edward G. Fox, president of the Philadelphia and Reading Coal and Iron Co., has announced the establishment of a Mineral Industries Research Grant at Pennsylvania State College for the study of the manufacture of carbon black and activated carbon from anthracite. The grant was made as one phase of a long-range experimental and research program the company is sponsoring, according to Mr. Fox, who added that its aim is to develop and ultimately conserve anthracite by increasing the useful knowledge of its chemical applications. This grant at Pennsylvania State College is in addition to a fellowship established at the Mellon Institute in Pittsburgh, the purpose of which is to investigate problems in connection with anthracite both as a fuel and as a source of chemicals. The work at Pennsylvania State College will be carried on under the direction of Dr. A. W. Gauger, director of the Mineral Industries Experiment Station at that institution. The station is a division of the college's School of Mineral Industries under Dean Edward Steidle.

Broderick Ordered to Pay Debts

Michael J. Broderick, owner of the K. & W. Rubber Corp. of Delaware, Ohio, now serving a two-year term for income tax evasion, was ordered by a Delaware court on September 18 to pay over $300,000 in debts by September 20 or lose his business. Three of his former attorneys had filed a foreclosure suit in Delaware in an attempt to collect on promissory notes which Mr. Broderick gave them in lieu of attorney fees. Mr. Broderick also owes the government back income taxes for 1944, 1945 and 1946. The grand total to be paid was $322,813.37. The K. & W. Rubber Corp. has been closed since its owner went to prison on April 13.

New Edition of Automobile Facts

One out of every eight tax dollars collected in the United States comes from automotive industries and highway users, according to the 32nd Edition of "Automobile Facts and Figures," for 1952, published by the Automobile Manufacturers Association, Detroit, Mich. This new 80-page booklet, annual statistical publication of the AMA, contains all the pertinent data relative to the production and use of automotive vehicles in the United States. Interesting charts and graphs point up many of the varied statistics presented in the booklet. A complete index enhances the value of the publication.

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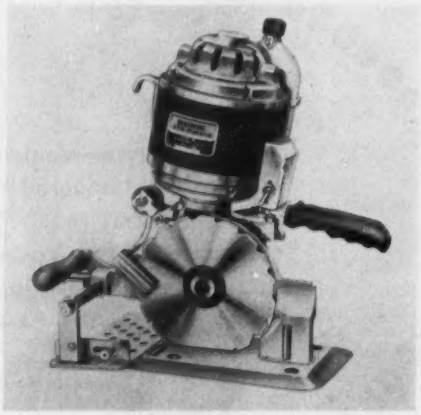
NEW EQUIPMENT

Maimin Stripomatik Cutting Machine

Development of a heavy-duty portable cutting machine that can accurately and quickly cut up to a 2-inch slab of 95 durometer rubber has been announced by the H. Maimin Co., Inc., 575 Eighth Ave., New York 18, N. Y. Called the Maimin Stripomatik, it is said to have the most powerful motor ever incorporated in a cutting machine and was designed specifically for use on rubber and rubber composition materials.

The machine is completely self-contained and has a water-feed attachment to lubricate and cool the cutting



blade. To further prevent friction, special rollers not only speed the cutting, but practically eliminate resistance. A durable and simple to operate gauge holds the rubber firmly and assures that every strip is cut to industrial tolerances. Hairline accuracy is said to be guaranteed, regardless of the thickness or the hardness of the rubber. The machine has its own self-sharpening mechanism. It has a two-handed control unit for steady and easy handling. Its base plate and blade support is made of bronze for greatest rigidity and durability. Easy passage of the knife through the rubber is facilitated by the position of the knife support behind the machine, and not at the side.

Stripomatik can be used as a single unit or set up in multiple installations as gang cutters within a production line for edge trimming and cutting to size in a coordinated operation. Described as able to cut a 1/32-inch rubber sheeting as easily as it handles the thicker layers, the machine was developed specifically to speed up the cutting of even a 2-inch thick rubber strip for a special requirement. Variations in the machine to meet individual rubber-cutting problems can be made.

A lighter weight similar portable cutter for rubber and rubberized materials, called the Maimin Slitter, made by the same company, has been in use for some years. This unit is made up in several sizes and is specially designed for slitting and trimming. It cuts layers up to 1-9/16 inches high and is particularly adaptable to thin and soft materials.

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Cabot Pine Products . . . are thoroughly analyzed and tested by the Cabot Laboratories for uniform, high quality performance in rubber. Staffed by trained technicians, the fully-equipped Cabot Laboratories offer you complete technical service.

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- **high tensile**
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We welcome the opportunity to submit a sample together with Technical Data.

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If it's steel wire- JOHNSON specialists make it better

Hose REINFORCEMENT WIRE

JOHNSON special bronze plated wire, for many years the preference of major tire manufacturers — now available for vacuum and defroster hose producers, in addition to conventional finish wire.

- Uniformly clean finish
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Johnson line of specialty wires also includes oil-tempered and coldrawn brush wire—tire bead wire—steel wire for field telephones—music spring wire.

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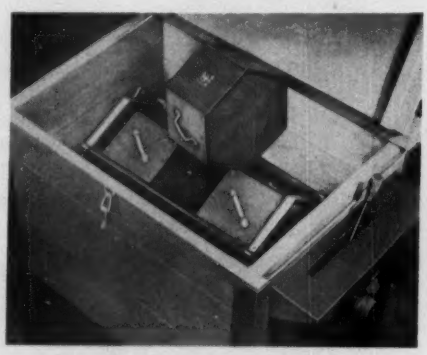
Tumb-L-Matic Pocket Tumbler

A new tumbling barrel having individual "pockets" for tumbling from 2 to 6 items at a time has been developed by Tumb-L-Matic, Inc., 4510 Bullard Avenue, New York 70, N. Y. The "Pocket Tumbler" is recommended for deburring, precision finishing and polishing small metal and plastic parts. The Pocket Tumbler comprises a rotating container, or "frame," into which the pockets fit. Both the pockets and the frame are hexagon-shaped. The frame is enclosed on five sides during tumbling to hold the pockets in. One side of the frame opens to permit pockets to be inserted and removed.



Pockets are equipped with handles for ease of handling. They open on the side adjacent to the handle. By having an extra supply of pockets, loading and unloading can be accomplished while other pockets are being tumbled and a near continuous batch operation can be achieved. Tumblers are available with frames for handling from 2 to 6 pockets. Pockets range from 12 to 16 inches in diameter.

The Pocket Tumbler shown is the submerged type for wet tumbling. The outer box-container holds water during tumbling. Also available is the self-contained type which can be adapted for either wet or dry operation. This type does not have the outer box-container but water can be added into the individual pockets when desired. In the self-contained design, wet and dry process barrels can, of course, be operated at the same time.

The removable pockets operating in a single frame enable the user to attain a high degree of interchangeability with a single piece of equipment. The equipment is suitable for all methods of tumbling by simply adding the recommended abrasive in any given pocket for the process to be carried out. The units can be furnished with variable speed drives which further increases their versatility.

Ultra-Violet Products, Inc., South Pasadena, Calif., has developed a new **Blak-Ray ultra violet source** designed specifically for industrial fluorescent inspection, processing and packing operations. The new unit covers an area of 20 to 40 square feet with intense (noninjurious) long wave ultra-violet radiation. Fluorescent inspection is proving valuable in the determination of complete coverage where transparent or hard-to-see sprays, fillers and coatings are applied on wood, rubber, plastic and metal.

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GRI

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Industrial Technology Courses are announced by Gidley Research Institute as Follows:

1. Industrial Technology and Chemistry of Rubber Manufacturing.
2. Industrial Technology and Practice of Latex Manufacturing.
3. Industrial Technology of Plastics Manufacturing.

Courses are available in residence or by Correspondence in both English and Spanish. Courses are designed for executives, chemists, engineers and technologists and stress actual factory practice. Gidley Research Institute was founded eleven years ago and has graduates from the United States and eleven foreign countries.

Write us for full details.

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Tackifiers can make your adhesive job BETTER . . . at lower cost, too!

A leading shoe manufacturer was having difficulty bonding vinyl welting. Poor adhesion caused an excessive number of rejects. This resulted in lost production time and an unusually high percentage of seconds.

Finally he incorporated ARCCO resin emulsion tackifier in his natural rubber latex — result, he is now getting production without rejects. Important, too, he is now enjoying worthwhile savings in his adhesive costs.

Specific types of resin emulsions, with varied properties, are available to users of natural and synthetic rubber latices where increased adhesion, tack or reinforcement is required.

TACKIFIERS and REINFORCERS FOR THE JOB — High Bond Strength · Quick Grab · Dry or Delayed Tack · Pressure Sensitivity Specific Adhesion · Cohesion · Improved Tensile · Economy.

COATINGS, SATURANTS, BINDERS, ADHESIVES, SIZES combining or laminating adhesives for fabric, paper, films and foils. Packaging adhesives · Shoe adhesives · Plush backsizing compounds. Paper saturants · Binders for asbestos, sisal fibers, curled hair.

For information on ARCCO Tackifiers and Reinforcers write for Data Sheet A-42.

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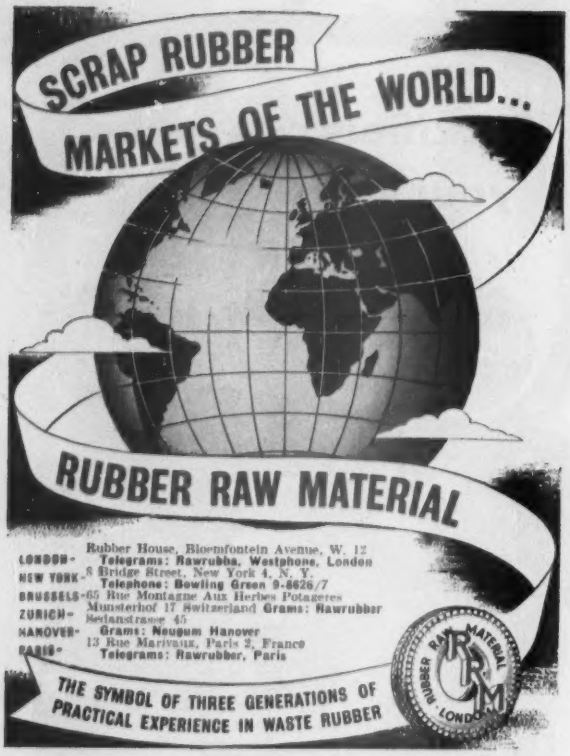
GENERAL OFFICES: *103 FOSTER STREET, PEABODY, MASSACHUSETTS*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3M is expanding its activities in the fields of rubber and plastics extrusions, and will give immediate consideration to the applications of engineers with the following qualifications.

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M.E. or Ch.E. Degree, at least two years' experience with equipment and processing methods of rubber and plastic extrusions.

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If you are interested in becoming part of an organization which traces over 80% of current sales to research developed products, please send complete resume to: Director of Technical Employment

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Adhesives and Coatings Division
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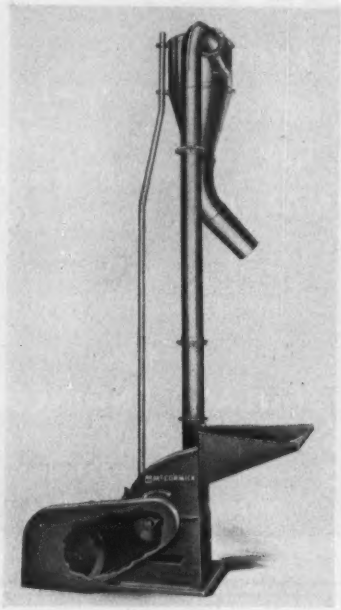
3M COMPANY

Hammer Mill for Crushing Dry Ice

The McCormick-Deering No. 4-E Hammer Mill marketed by the General Sales Department of the International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill., was basically designed for grinding animal feed, providing efficient, low-cost grinding with minimum power. The same unit is now being used by



several rubber manufacturers to crush dry ice for use in tumbling apparatus in deflashing operations.

The No. 4-E hammer mill is a small size mill that can be operated by an electric motor of 3, 5 or 7½ h.p. When so powered it can be permanently installed and operated all day with minimum attention. The rotor housing is sturdily constructed of 12-gauge steel while the rotor itself is composed of three steel discs welded to the rotor shaft, cradled on self-aligning ball bearings. The rotor and hammers are accurately balanced, assuring smooth operation. A blower fan, mounted on the same shaft, is a one-piece, five-bladed, cast unit. Pressure-grease fittings provide positive lubrication to the ball bearings.

The rotor and blower fan have a speed of 3200 to 3500 r.p.m. The diameter of the rotor, with hammers extended, is 12 inches. There are 20 hammers in the mill, each measuring 2 x 4⅞ x ¼ inch. The grinding plate area is 123 square inches and the screen area is 148 square inches. Total grinding area is 271 square inches. Floor space required for the mill is 38-inch length and 25-inch width.

A new model of its widely used **NRM 2½-Inch Oil-Heated Plastics Extruder** was recently announced by the Plastics Machinery Division, National Rubber Machinery Co., Akron 8, Ohio. Designated the Model 50, it features a new, totally-enclosed 15 h.p. drive transmission, with a heavy-duty cone worm gear reduction unit. Most parts are interchangeable with other 2½-inch oil-heated extruders made by the company.

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First to Present as Prime Producers

AQUEOUS SUSPENSIONS OF ULTRA ACCELERATORS,
BY A NEW PROCESS, FOR LATEX COMPOUNDING

VULCACURE*

VULCACURE ZM
50% Zinc Dimethyldithiocarbamate

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PARTICLE SIZE EQUIVALENT TO FORTY-EIGHT HOUR BALL MILLED DISPERSIONS

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Completely *New* Mechanical Method of Additive Weight Loading— *simple, positive*

Performs elongation test on rubber and other elastomers, suspended in a free static condition for a predetermined period of time.

4 stress ranges: 50, 100, 200 and 400 lbs. psi.

Additive weight control wheels are adjusted to number corresponding to number observed on thickness gage for sample — weight addition automatic.

Operator remains seated. Mirror system permits direct viewing and control. Test figure appears as a percentage of the original gage length, no computation.

***Reference does not constitute endorsement by the Bureau.*

REQUEST BULLETIN

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Scott Testers — Standard of the World

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Model D-25 Knitter & Take-up Reel Stand

Gives you faster production at less cost

★ Improve product quality
★ Increase speed 300%
★ No yarn rewinding or treating
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★ Conserve floor space
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★ Reduce power requirements
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★ Controls are fully automatic
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Producing strong flexible hose with this Fidelity Hose Reinforcement Machine at lower cost puts you ahead of competition. Produced in continuous lengths at over 1,000 feet every hour, *Knit*-Reinforced is widely used as garden, automotive heater and radiator, and industrial hose.

The Fidelity *Knitter* uses only 4 yarn cones, each weighing 10 pounds. *Knitting* eliminates costly rewinding and treating operations and drying time. Diameters are uniform; adhesion is stronger. Automatic electric stop motions and other advanced features cut maintenance and down time.

Automatic Take-up Reel Stands are available for both single or double deck *Knitters*. To see why top companies choose Fidelity, read our literature proving its advantages. Write today for Catalog I.

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Foxboro Model P Test Gauge

A periodic check of pressure instruments with a reliable test gauge has been known, in many instances, to save process fluid or otherwise reduce operating costs in amounts many times the cost of the test device. Such an instrument is the 6-inch Model P Test Gauge, made by the Foxboro Company, Foxboro, Mass. This inexpensive gauge not only serves in checking pressure controllers, recorders and indicators, but also furnishes a standard of accuracy for calibrating other pressure testing equipment in the instrument department.

The Model P Test Gauge is furnished in ranges of 0 to 30 Hg vac. up to 0 to 10,000 psig, and guaranteed accurate within ½ of 1% of the total scale at any point throughout its range. Suitable tapered pipe male thread connections are provided. Construction is of specially selected materials. The case is cast aluminum threaded to receive a brass ring which is finished to match the case. The measuring element is a full 270° Bourdon spring of steel or beryllium copper. The movement consists of a chrome-plated steel pinion, segment and arbor, monel plates and a stainless steel hairspring. A stainless steel micrometer-adjusted pointer facilitates precision measurements on an easy-to-read dial. A durable leather carrying case, with shoulder strap, is optional.

Rapid Cure?

SEE PAGE 4

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for Rubber Compounding

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Improves Processing — Improves Electrical Characteristics
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EXCELLENT COMPATABILITY WITH

GRS Rubbers—All Types — Buna N Type Rubbers
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Handles 0.5 Gram to 10 Grams of Rubber Samples Plus Compounding Ingredients!

NEW LABORATORY RUBBER COMPOUND MILL

DEVELOPED AT UNIVERSITY OF BUFFALO

A flawless, silent operating Rubber Compound Mill has been developed by Dr. Goldfinger of the University of Buffalo. Its ingenious design permits up to three batches of samples, compounded separately and totaling 50 grams to be mixed to give a uniform product!
It is the smallest, most compact of all rubber mills—and the most effective to use.
Easier and faster on original breakdown of extremely tough samples than ordinary mills—with an enclosed unit that spells economy in operation.

Every rubber research worker—and technicians in allied fields will want to investigate the advantages of this great mill.

Write for Valuable Bulletin RA-107

Ivan Sorvall, inc.

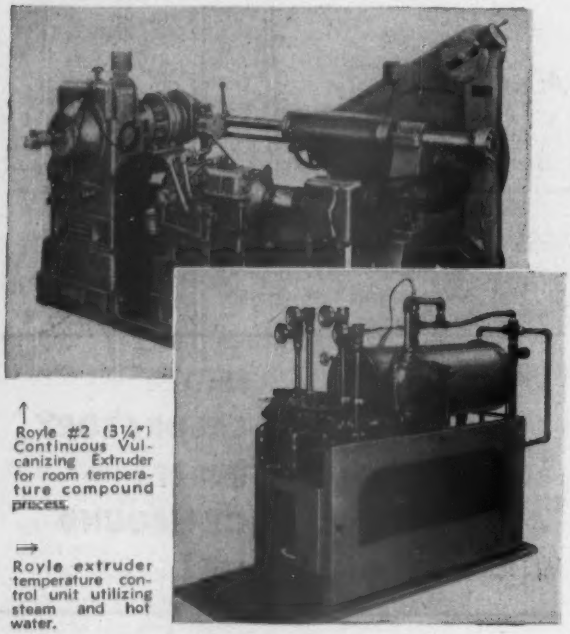
210 FIFTH AVENUE, NEW YORK 10, N. Y.

Of Particular Importance

To the Wire Insulating Industry

The room temperature compound process and associated equipment recently developed by the Western Electric Company, Incorporated, offer nine important advantages. These advantages begin with the storage of completely mixed, ready-to-extrude, rubber, GR-S, or Neoprene compounds and extend to a smoother and improved appearance for the finished product.

The complete extruder vulcanizing portion of the room temperature compound process is available to insulated wire producers* from John Royle and Sons who, for seventy-two years, have been building extruding machines to meet the most exacting process requirements.



↑ Royle #2 (3¼") Continuous Vulcanizing Extruder for room temperature compound process.

⟹ Royle extruder temperature control unit utilizing steam and hot water.

CHECK THESE ADVANTAGES:

- Improved diameter control
- Reduction in compound scrap
- Reduction in electrical faults
- Permits storage of completely mixed compounds
- Permits more economical scheduling of mixing equipment
- Eliminates "warm-up" operation
- Possible mill-room economies
- "Hot" machines may be converted
- Finished product has smoother finish—better appearance

**Licensees of Western Electric Company*

JOHN ROYLE & SONS
10 ESSEX STREET, PATERSON 3, NEW JERSEY

REVIEWS

BOOKS

Safe Working on Horizontal Two-Roll Mills. National Joint Industrial Council for the Rubber Manufacturing Industry, 236 Royal Exchange, Cross St., Manchester 2, England. 5½ x 8½ in. 108 pp.

Recognizing the importance of reducing accidents of all kinds in rubber manufacturing plants, the National Joint Industrial Council for the Rubber Manufacturing Industry (in England) some time ago formed an Accident Prevention Committee. This committee, in turn, established an Engineers' Advisory Committee, whose first problem was the prevention of nip accidents. The latter unit, after due consideration, turned the problem over to a special sub-committee, the report of which is incorporated in this book.

The book covers photo-electric, electronic, radio-active and similar devices currently used to protect operators of horizontal two-roll mills and deals largely with the principles for safe working developed by R. W. Lunn and his co-workers. In fact, the report of the subcommittee confirms the fact that Mr. Lunn's analysis is capable of giving an accurate assessment of mill conditions in relation to safe working. The book offers no precise formula which can fit exactly all existing two-roll mills, with their differing conditions of position, design, speed, etc., but its aim is to provide a "process of thought" and at the same time a "method of examination" based on absolute and unavoidable fundamentals, by which each case can be judged, and which will provide a plain indication of the conditions needed to achieve safety.

The book is divided into eight sections, as follows: (1) History; (2) Aims of the Committee; (3) The Problem; (4) The Theory; (5) Application to Machines; (6) Application to Men; (7) Practical Demonstration (by diagram and photograph of existing types of machines); (8) Policy. In addition, there is an appendix crammed with vital information, such as data on brakes or stopping devices, a method for measuring mill stopping distances, special application to small-size laboratory mills, and a glossary of terms. There is also a short bibliography, proving that the subject has not been given the attention it well deserves. Every rubber plant utilizing two-roll mills should have a copy of this book.

•

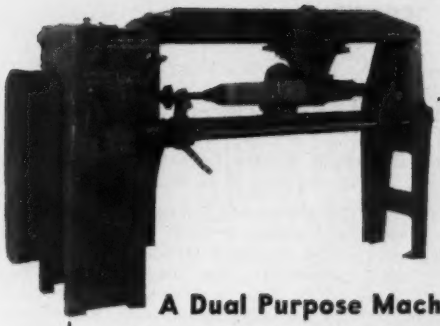
Chemical Engineering Operations. By F. Rumford. Chemical Publishing Co., Inc., 212 Fifth Ave., New York 10, N. Y. 5½ x 8½ in. 376 pp. $7.50.

Designed as a text book for student use, this book provides an introduction to those processes which are peculiar to chemical plant practice, such as pumping, heat transfer, extraction, drying, mixing, size reduction, solid separation and measurement. Each process is the subject of a separate chapter, and the principal types of apparatus required for carrying out each one is described and illustrated. Processes and equipment are both evaluated from the viewpoint of efficiency and economy, while the theoretical aspects of chemical works procedures are covered and their mathematical foundations given. There are 17 chapters in all, some 200 illustrations, and a subject index.

•

Economics of American Manufacturing. By Edward L. Allen. Published by Henry Holt & Co., 383 Madison Ave., New York 17, N. Y. 6¼ x 9¼ in. 566 pp. $6.95.

This book offers a penetrating cross-section view of American industry. The author, a well-known industrial economist, examines 19 representative industries within five general categories, i.e., basic metal, basic non-metallic, metal working, textile, and consumer specialty. Each industry is analyzed from the standpoint of its setting in the national economy, structure, and financial factors. A full chapter on the rubber industry is included, with some excellent charts and illustrations. A section of this chapter is devoted to the future outlook which, according to the author, should prove more stable than the past.



A Dual Purpose Machine For Grinding and Polishing

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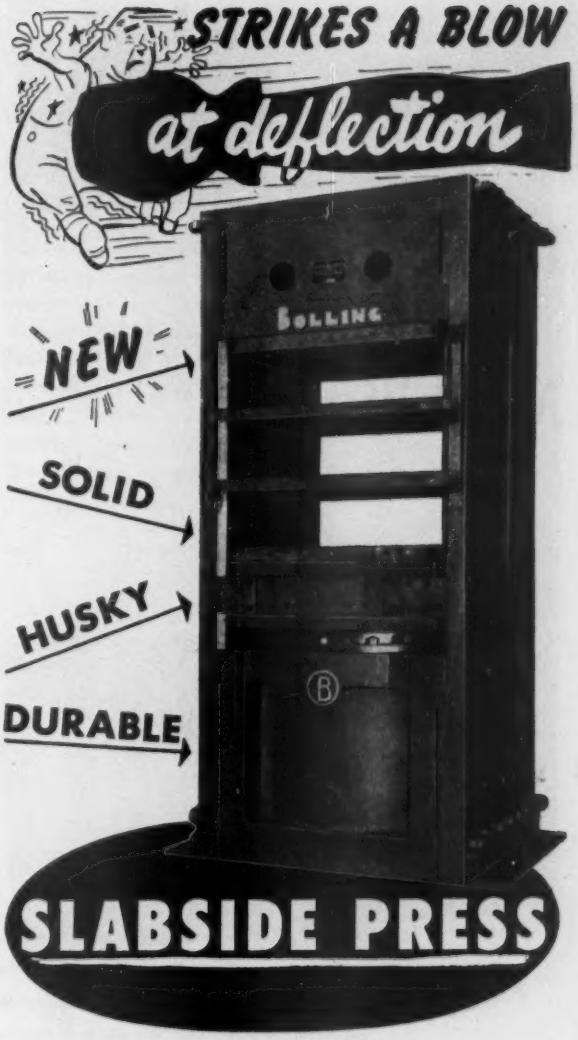

–A 48" x 48", 1000-TON, SLABSIDE PRESS

Plenty husky! We made it so—deliberately! We could have "saved" here and there by lightening the construction, but we elected not to. This new press is designed with weight where weight ought to be—to withstand pounding and strike a *powerful* blow at deflection. It has all the stamina you have come to associate with Bolling design and construction.

* * *

Write for Catalog "A-10."

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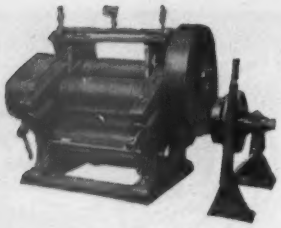
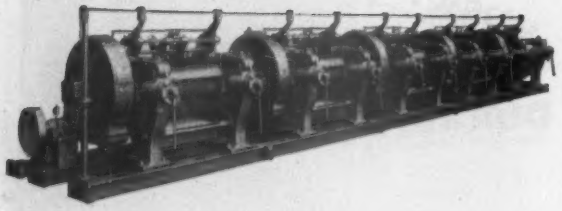
B INTENSIVE MIXERS • MILLS • CALENDERS
REFINERS • CRACKERS • HYDRAULIC PRESSES
PUMP UNITS • BALE SLITTERS • SPEED REDUCERS

Rubber Plantation Machinery



Illustrated above is a heavy duty machine, constructed robustly for high outputs having rolls 28" long x 14" dia. and fitted with adjustable guide plates. Shown below is a battery of 5 heavy duty 30" x 14" Horizontal washers.



There is a full range of Shaw Rubber Plantation Machinery available for washing and sheeting rubber on the plantations, and also for the production of sole crepe. We will be pleased to send literature and full details of this machinery.

SHAW

FRANCIS SHAW & COMPANY LIMITED
MANCHESTER 11, ENGLAND

BOOKLETS, CATALOGS, etc.

RC Latex and Chemicals. Rubber Corporation of America, 274 Ten Eyck St., Brooklyn 6, N. Y. 8½ x 10½ in. 28 pp.

The properties and applications of the numerous products of the company's Latex and Chemical Division are detailed in this attractive, two-color booklet. Separate sections are devoted to latices, plastisols and plasticizers. The latex section includes data on Hevea latex, GR-S latex, and natural and synthetic latex compounds, the latter including special compounds for dipping, molding, foam, thread, coating and combining, and adhesives and impregnation. The plastisol section covers RC Plastisols for dipping, molding and casting, and for coating, and includes a range of physical properties. The plasticizer section contains descriptive data on several ester-type plasticizers marketed by the company, including dibutyl phthalate, triethylene glycol dicaprylate, di-isooctyl phthalate, di-isooctyl adipate, and a relatively new one, iso-octyl palmitate. Specifications are given in each instance, together with typical properties.

•

New Ideas in Cleaning for the Rubber Industry. Oakite Products, Inc., 19 Rector St., New York 6, N. Y. 3½ x 8½ in. 24 pp.

How the cleaning of rubber processing equipment is simplified by the use of specialized detergents that dissolve, emulsify and break up soils so that deposits are rinsed away is outlined in this booklet. Among the many cleaning and related operations for which the booklet lists specific materials and procedures are the following: cleaning steel, iron and aluminum molds; cleaning molds by steam-detergent methods; removing lime scale from water jackets of press platens, calender rolls, reactors, etc.; removing carbonized rubber deposits from conveyors, and treating sheet rubber before storage or shipping. Some data on preparing metal prior to rubber bonding is also included in the booklet.

•

Machinery for Processing Rubber and Plastics. (Catalog 52). Stewart Bolling & Co., Inc., 3190 East 65th St., Cleveland 27, Ohio. 8½ x 11 in. 64 pp.

This catalog, featuring 144 illustrations, describes machinery and equipment for processing rubber, plastics and other materials. The main types of equipment described are "Spiral-Flow" intensive mixers, calenders, crackers, mills, refiners, hydraulic presses, pump units, bale slitters, speed-reducers, and vulcanizers. The handsomely designed catalog contains a handy index. A section of the publication is devoted to rebuilt machinery and equipment available from the company.

•

B-L-E Antioxidant. (Compounding Research Report No. 19). Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn. 8½ x 11 in. 12 pp.

Chemical and physical properties of B-L-E, an antioxidant for developing superaging and flexing resistance, are given in this technical report. Typical compounds incorporating B-L-E, including natural rubber treads, passenger tire carcass stock, Paracril molded stock, and neoprene molded stock are included, with physicals shown in each instance. Some data on B-L-E emulsification for GR-S polymer plant use and latex compounding is also included in the report.

•

Taylor-Stiles Cutters for the Rubber Industry. Taylor, Stiles & Co., Riegelsville, N. J. 8½ x 11 in. 4 pp.

A good deal of information on the various cutting units made by the company for the rubber manufacturing industry is crammed into the four pages of this folder. The special features of the cutters, including the specially designed shearing action, are emphasized and illustrations of the various classes of cutters available are shown. A few of the many uses of the cutters in the rubber industry are listed, while a number of materials currently being cut on the company's machines are detailed.

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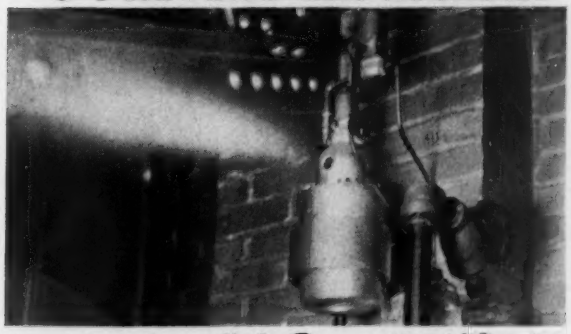

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ARMSTRONG air-controlled Steam Humidifiers are worth their weight in gold wherever explosive vapors are present. By adding steam directly to the air, these units automatically maintain the relative humidity necessary to dispel any chance of a static electricity spark.

Simple, wholly dependable and economical, Armstrong Steam Humidifiers have been thoroughly tested and proven in rubber cement house applications. Humidifiers can be shipped from stock, ready for easy installation. GUARANTEED TO SATISFY or your money back.

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Scrap Rubber

•

Natural Rubber

•

Plastic Scrap

Representatives for:
S. J. PIKE & CO., INC.
Crude Rubber Importers
30 Church Street
New York 7, New York

Liquid Agitators and Processing Vessels. Mixing Equipment Division, Struthers Wells Corp., Warren, Penna. 8½ x 11 in. 16 pp.

Following an outline of the fundamentals of four types of liquid agitation—propeller, open impeller, shrouded turbine and radial propeller—this bulletin presents technical details, illustrations, dimensional drawings and size data on a variety of the company's equipment. Included are marine propeller agitators, radial propeller agitators, agitator drives, and an advanced agitator design for the quick dispersion of liquids, gases and solids. Also in the bulletin is a section on mixing equipment for solids, semi-solids, pastes and liquids, as well as a number of pages devoted to custom-made pressure vessels which are manufactured to standard design. This latter section includes drawings and extensive data on a few of the many capacities available.

•

Staycin 1. Baker Castor Oil Co., 120 Broadway, New York 5, N. Y. 8½ x 11 in. 4 pp.

Staycin 1, the company's new vinyl stabilizer, is described in this folder. The product is described as being of quadruple purpose in that it stabilizes against heat degradation, stabilizes against light attack, lubricates, and inhibits the exudation of oil-type plasticizers. The folder describes what the product is, what it looks like, how it may be used, and considers the matter of relative cost.

•

Worthington Feather Valve Compressors. (Bulletin L-676-B1). Worthington Corp., Harrison, N. J. 8½ x 11 in. 32 pp.

Worthington Type YC and DYC Compressors are described and illustrated in this bulletin. The component parts of the two units are considered as to their function. Sectional and cutaway views are provided and construction features discussed. Also discussed is the matter of controls and auxiliary equipment. Photographs of actual installations are included.

•

B. F. Goodrich Industrial Tire Guidebook. B. F. Goodrich Co., Akron, Ohio. 8½ x 11 in. 12 pp.

Intended for users of materials handling equipment, this guidebook shows the complete Goodrich industrial tire line, the service in which each tire should be used, and gives many helpful maintenance tips on the care of industrial tires. The guidebook also points out the advantages of the company's Tire and Wheel Analysis Plan.

HAD A COLD—BUT GOT CURED QUICK
Borger, Texas Character Says "You Get, For Sure, Easy Processing, Rapid Cure"
Rapid Cure?
SEE PAGE 4

tire molds
special machinery
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fair prices
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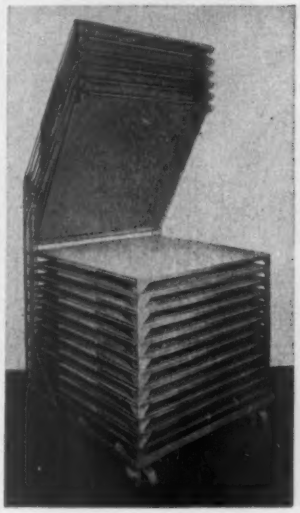
your inquiries are solicited

THE AKRON EQUIPMENT CO.
Akron 9, Ohio

SPRING LEAF TRUCK



This new Truck gives unobstructed access to three sides of each tray and offers a convenient method for storing materials that require cooling or air drying. The one piece construction Trays are spring supported and can be quickly raised or lowered, free from all locking devices. Trucks having 18 perforated trays 36" x 36" or plain surface trays 36" deep by 4 ft., 6 ft. and 8 ft. long, can be furnished either stationary or mounted on casters.

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1903
SPRINGFIELD, NEW JERSEY

Vulcanized
VEGETABLE OILS

rubber substitutes

Types, grades and blends
for every purpose, wherever
Vulcanized Vegetable Oils
can be used in production
of Rubber Goods—
be they Synthetic, Natural,
or Reclaimed.

A long established and proven product.

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SPRINGFIELD, NEW JERSEY

Represented by
HARWICK STANDARD CHEMICAL CO.
Akron, Boston, Trenton, Chicago, Denver, Los Angeles

New Ideas for Efficient Passenger Transportation. By Col. Sidney H. Bingham. Copies available from the Goodyear Tire & Rubber Co., Akron, Ohio. 8½ x 5⅝ in. 16 pp.

Revolutionary modes of transportation may be the solution to the traffic and transit problems of our metropolitan centers, the author of this interesting brochure declares. Col. Bingham is chairman of the Board of Transportation of New York City and an independent traffic consultant. The author discusses the application of conveyor belts as a solution to transit problems. Such factors as efficiency, initial cost, cost of operation and traveler convenience are discussed. The brochure is illustrated with drawings of the projected conveyor belt shuttle system proposed between Grand Central Station and Times Square Station in New York City.

•

Corn in Industry. Corn Industries Research Foundation, Inc., 3 East 45th St., New York, N. Y. 8½ x 11 in. 63 pp.

This is the third edition of this interesting booklet, describing the industrial uses to which corn is put. Some 15% of the yearly corn crop, about 500,000,000 bushels, goes into industry each year, where it is processed into a variety of things essential to everyday life. Some of the topics covered in this booklet include the corn refining process, corn products and their uses, and corn in the defense program. Many photographs included in the booklet depict processing operations and products and by-products of corn.

•

Le-Hi Hose Clamps. (Bulletin 125). Hose Accessories Co., Philadelphia 32, Penna. 8½ x 11 in. 4 pp.

The complete line of Le-Hi hose clamps for every industrial rubber hose application is described in this comprehensive bulletin. Profusely illustrated, the bulletin contains complete information on all types and sizes of clamps manufactured by the company. Capacities and applications of the clamps are also outlined.

•

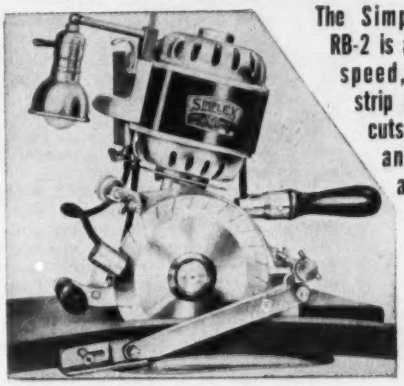
Ko-Blend I. S. Chemical Division, General Tire & Rubber Co., Akron, Ohio. 8½ x 11 in. 4 pp.

A description on the use of "Ko-Blend I. S.", a latex-compounded masterbatch of insoluble sulfur, appears in this folder. Advantages of the product are discussed as is the method of preparation. The uses to which Ko-Blend I. S. may be put are also outlined.

Rapid Cure?
SEE PAGE 4

SIMPLEX
REG. TRADE MARK

CUT 2500 FEET OF STRIP PER HOUR



The Simplex Model RB-2 is a new high-speed, portable strip cutter that cuts efficiently and accurately.

The new Model RB-2 has a maximum cutting thickness of two inches, weighs 44.5 pounds, and is available in both A.C. and D.C. types. Manually operated, the machine is capable of cutting up to 20,000 feet of rubber strip in eight hours. A series of slits in the edge of the cutting blade carries water from a reservoir into the cut and not just to the top of the rubber being cut. This method lubricates the entire cut and produces a straight and even edge.

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- Triethylene Glycol Dicaprylate—(TG-8)
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- Di-iso-octyl Adipate—(DIOA)
- Iso-octyl Palmitate—(O-16)

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MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK, OCT. 9, 1952

Natural Rubber

The price of spot rubber on the New York Commodity Exchange has swung in a range of 2.25c since our last report (September 5), high for the period being 29c reached on September 30, and low being 26.75c reached on September 8 and again on October 1. The average price of spot rubber for the month of September was 27.42c based on 21 trading days. This compares with an average of 29.36 in August.

In the last few weeks, the price of various grades of natural rubber has been averaging substantially below that of synthetic rubber. There exists in this country a supply of rubber equal to almost three months consumption. In addition, government rotation rubber may soon become available.

Trade spokesmen say that unless the price of natural rubber drifts to still lower levels, it is difficult to see any important increase in demand. Should the market rise, manufacturers are said to be in a position to "wait and see."

Today's quotations for the outside market, London and Singapore, follow:

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.27
October	.26⅜
November	.26⅛
Thin Latex Crepe:	
Spot	.36
Thin Brown Crepe, No. 2	.23½
Smoked Blankets	.22¼
Flat Bark Crepe	.20

London Market

(Standard Smoked Sheets)

November	25.67 - 25.96
December	25.67 - 25.96

Singapore Market

(Standard Smoked Sheets)

November	24.57 - 24.68

Closing Rubber Prices on New York Commodity Exchange (No. 1 R.S.S. Contract)

FROM SEPTEMBER 6 TO OCTOBER 9

Sept.	Spot	Dec.	Mar.	May	July	Sales
6	—	—	—	—	—	—
7	—	—	—	—	—	—
8	26.75	25.65	25.00	24.70	24.60	50
9	26.75	25.80	25.00	24.70	24.50	86
10	27.75	26.15	25.40	25.10	24.90	101
11	27.75	26.20	25.20	25.05	24.90	58
12	27.25	25.90	25.00	24.65	24.50	67
13	—	—	—	—	—	—
14	—	—	—	—	—	—
15	27.25	26.15	24.95	24.80	24.65	4
16	27.38	26.80	25.75	25.45	25.30	24
17	27.50	26.40	25.40	25.10	24.95	27
18	27.50	26.50	25.40	25.10	24.90	49
19	27.38	26.50	25.35	25.10	24.80	0
20	—	—	—	—	—	—
21	—	—	—	—	—	—
22	27.50	27.00	25.90	25.65	25.35	35
23	27.00	26.55	25.45	25.10	24.80	55
24	27.25	26.50	25.15	25.00	24.70	34
25	27.50	26.70	25.45	25.30	25.00	22
26	27.25	26.50	25.15	24.85	24.60	0
27	—	—	—	—	—	—
28	—	—	—	—	—	—
29	27.00	26.40	25.15	24.85	24.60	9
30	29.00	26.21	24.95	24.50	24.50	46
Oct.						
1	26.75	26.25	24.91	24.50	24.45	2
2	28.00	26.40	24.90	24.60	24.55	5
3	27.75	26.75	25.00	24.60	24.55	29
4	—	—	—	—	—	—
5	—	—	—	—	—	—
6	27.00	26.30	24.90	24.60	24.55	17
7	26.75	26.20	24.90	24.50	24.45	13
8	27.00	26.40	25.35	24.75	24.50	77
9	27.00	26.40	25.25	24.90	24.55	7

Scrap Rubber

There is some evidence, according to trade circles, that the scrap rubber market may soon be on the rise. Scrap rubber is plentiful except for a few special items such as red tubes, where demand exceeds the supply. Present buying prices are considerably below the official Office of Price Stabilization ceilings, published below:

(Prices Delivered Akron)

Mixed tires	ton	$26.00
Mixed headless tires	ton	34.00
Light colored carcass	ton	130.00
Black carcass	ton	50.00
No. 1 peelings	ton	65.00
No. 2 peelings	ton	42.00
No. 3 peelings	ton	38.00
Buffings	ton	30.00
Truck and Bus S.A.G.	ton	28.00
Passenger S.A.G.	ton	28.00
Mixed S.A.G.	ton	26.00
Light colored tubes	lb.	.16
Natural rubber red tubes	lb.	.16
Natural rubber black tubes	lb.	.11½
Mixed natural rubber tubes	lb.	.10
Butyl rubber tubes	lb.	.057
GR-S rubber tubes	lb.	02
Mixed synthetic tubes	lb.	.03

Reclaimed Rubber

Trade sources indicate that the outlook for the reclaimed rubber market is encouraging. September showed an appreciable increase in demand over August, while October should be even better. The automobile industry is planning an increased schedule for the last quarter of 1952, and this has reflected a greater demand for reclaim. OPS-established prices for reclaimed rubber follow:

(Prices for All Areas Except Calif.)

Premium Grade Whole Tire	.10½
First Line Whole Tire	.10
Second Line Whole Tire	.09½
Third Line Whole Tire	.09½
Fourth Line Whole Tire	.08½
Black Carcass	.14½
No. 1 Light Colored Carcass	.20¼
No. 1 Select Peel	.11¾
No. 1 Peel	.10½
Butyl Tube Reclaim	.14½
S.P. Natural Rubber Black Tube	.21
Natural Rubber Black Tube	.20
Natural Rubber Red Tube	.24¼
Natural Rubber Gray Tube	.24¼

Cotton Tire Fabrics

During the past period there has been a fair amount of interest in chafers, according to the trade, while there has not been too much activity in the cotton tire cord line. The trade is loathe to predict what, if any, changes are to be expected in the next few months. Prices remain at substantially the same levels:

Standard, Peeler, 12/4/2	lb.	.85
Extra Staple, Peeler, 12/4/2	lb.	.91

Chafers

14.4 oz. (per square yard)	lb.	.81
9.25 oz. (per sq. yard)	lb.	.75½
11.65 oz. (per sq. yard)	lb.	.72
8.9 oz. (per sq. yard)	lb.	.77½

Cotton

Since our last report (September 5), the price of middling uplands on the New York Cotton Exchange has moved in a range of 2.40c, high for the period being 40.75c reached on September 8, and low being 38.20c reached on October 8. The average price of middling uplands for the month of September was 39.75c based on 21 trading days. This compares with an average of 40.42 in August.

The International Cotton Advisory Committee said on October 5 that the 1952-53 world cotton production will exceed world consumption if consumption again reaches or even exceeds last season's 25,000,000 bales. It said that the prospective supply and demand in the United States in the 1952-53 season is roughly in balance. However, a tight situation could develop if there were any significanct rise in domestic consumption or if exports were near the 5,000,000 bale mark, or if the October crop report were to show a big reduction from the present estimate of 13,700,000 running bales.

Reports from Washington state that Mutual Security Administration statisticians have revised their ideas of cotton exports downward. Recently, MSA predicted exports of slightly more than 5,000,000 bales, but now has placed this estimate under that figure. MSA will soon issue its authorizations, and is expected to urge foreign countries to purchase their cotton while the crop is moving.

Secretary of Agriculture Brannan has announced there will be no marketing quotas or acreage allotments on upland or extra-long staple cotton produced in 1953. Latest available government statistics indicate that the total supply of upland cotton does not exceed the normal supply, the department said.

Quotations for middling uplands on the Exchange follow:

	Sept. 5	October 9		
	Close	High	Low	Close
Oct.	39.28	37.93	37.59	37.72
Dec.	39.20	38.12	37.76	37.83
Mar.	39.16	38.17	37.80	37.87

Synthetic Rubber

(Dry Types—Per Pound)

Butaprene NF	.490 - .500
Butaprene NL	.500 - .510
Butaprene NAA	.540 - .550
Butaprene NXM	.580 - .590
Chemigum 30N4NS	.500 - .510
Chemigum 50N4NS	.500 - .510
Chemigum N3	.580 - .590
G-E Silicone Rubber (compounded)	3.15 -4.00
G-E Silicone Gum (not compounded)	—— -4.48
GR-I	—— - .2075
GR-S	—— - .230
Hycar OR-15	.580 - .590
Hycar OR-25	.500 - .510
Hycar OS-10	.550 - .560
Neoprene Types CG and AC	—— - .500
Neoprene Type E	—— - .650
Neoprene Types FR and KNR	—— - .800
Neoprene Type GN	—— - .380
Neoprene Type GN-A	—— - .380
Neoprene Type RT	—— - .400
Neoprene Type S	—— - .380
Neoprene Type W	—— - .400
Paracril B	.500 - .510
Paracril BJ	.500 - .510
Paracril C	.580 - .590
Silastic (compounded)	2.35 -4.40
Thiokol Type A	—— - .470
Thiokol Type FA	—— - .640
Thiokol PR-1	—— - .950
Thiokol Type ST	—— -1.000

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CURRENT MARKET PRICES

Of Rubber Chemicals and Compounding Ingredients

OCTOBER 7, 1952

Prices are, in general, f.o.b. works. Range of prices indicates grade or quantity variations.

Abbreviations: bbls., barrels; c.l., carlot; cyl., cylinder; dlvd., delivered; dms., drums; l.c.l., less than carlot; M.B., masterbatch; min., minimum; ref., refined; sap., saponified; sp., special; syn., synthetic; t.c., tank cars.

***For Export Only**

The arrangement of this section closely follows the Chemical Section of the 1951-52 RUBBER RED BOOK. Readers are referred to the RUBBER RED BOOK for the correct classification of any material or brand name. Suppliers of every material are contacted for price information. However, only those materials are listed for which quotations have been furnished within the past six months. The quotations are not guaranteed and prospective purchasers should contact suppliers for information. Suppliers are requested to send current price information to the Market Editor, RUBBER AGE.

ACCELERATORS

A-1 (Thiocarbanilide)	lb.	.48	.55
A-32	lb.	.61	.68
A-77	lb.	.47	.60
A-100	lb.	.47	.60
Accelerator No. 8	lb.	—	1.01½
Accelerator—49	lb.	.49½	.50½
Accelerator—552	lb.	—	2.07
Accelerator—833	lb.	.61	.63
Accelerator—833	lb.	1.17	1.19
Altax	lb.	.43½	.45½
Ancap *	lb.	.34	.36
Ancatax *	lb.	.42	.44
Ancazate * BU (ET & ME)	lb.	—	1.00
Ancazide * ET	lb.	—	1.00
ME	lb.	—	1.10
Arazate	lb.	—	2.23½
Beutene	lb.	.61	.63
Bismate, Rodform	lb.	—	3.00
Butasan	lb.	—	1.03½
Butazate	lb.	—	1.03½
Butyl Eight	lb.	1.00	1.35
Captax	lb.	.35	.37
C-P-B	lb.	—	1.95
Cumate, Rodform	lb.	—	1.45
Dibenzo G-M-F	lb.	—	2.58½
Diorthotolylguanidine	lb.	.54	.55
Diphenylguanidine	lb.	.44½	.50½
El-Sixty	lb.	.46½	.53½
Ethasan	lb.	—	1.03½
Ethazate	lb.	—	1.03½
Ethex	lb.	—	1.00
Ethyl Thiurad	lb.	—	1.03½
Ethyl Tuex	lb.	—	1.03½
Ethylac	lb.	.91	.93
G-M-F	lb.	—	2.58
Good-rite Erie	lb.	.35	.37
Guantal	lb.	.55	.62
Harvex	lb.	.52	.57
Hepteen	lb.	.43½	.45½
Base	lb.	1.80	1.85
Ledate, Rodform	lb.	—	1.00
Merac	gal.	.75	.80
Mercaptobenzothiazole	lb.	.35	.37
Mercaptobenzothiazyl Disulfide	lb.	.43½	.45½
Mertax	lb.	.45½	.52½
Methasan	lb.	—	1.03½
Methazate	lb.	—	1.03½
Monex	lb.	—	1.13½
Mono Thiurad	lb.	—	1.13½
Morfex	lb.	.61	.63
2-MT	lb.	—	.77½
NA-22 (for neoprene)	lb.	—	1.50
O-X-A-F	lb.	.44½	.46½
Pentex	lb.	—	1.03½
Flour	lb.	—	.20½
Permalux (for neoprene)	lb.	—	2.17
Phenex	lb.	.49	.54
Pip-Pip	lb.	—	2.07
R-2 Crystals	lb.	—	2.20
Rotax	lb.	.45½	.47½
RZ-50	lb.	—	1.00
SA 52	lb.	—	1.13½
SA 57	lb.	—	1.03½
SA 62	lb.	—	1.03½
SA 66	lb.	—	1.50
SA 67	lb.	—	1.03½
SA 77	lb.	—	1.03½
Safex	lb.	—	1.15
Santocure	lb.	.68	.75
Selazate	lb.	—	1.45
Selenac (Ethyl, Methyl)	lb.	—	1.50
Setsit-5	lb.	.75	1.05
SPDX-GH (tons)	lb.	.64	.69
GL	lb.	—	.95
Tellurac	lb.	—	1.45
Tepidone	lb.	—	.55
Tetrone A	lb.	—	1.91
Thiofide	lb.	.43½	.50½
S	lb.	.46½	.53½
Thionex	lb.	—	1.13½
Thiotax	lb.	.35	.42
Thiurad	lb.	—	1.13½
Thiuram E	lb.	—	1.03½
M	lb.	—	1.13½
Trimene	lb.	.56	.58
Base	lb.	1.03	1.06
Tuads, Ethyl	lb.	—	1.03½
Tuads, Methyl	lb.	—	1.13½
Tuex	lb.	—	1.13½
Ultex	lb.	1.00	1.05
Unads	lb.	—	1.10
Ureka Base	lb.	.66	.73
Vitasan Crystals	lb.	.48	.53
Vulcacure NB	lb.	—	.45
ZB	lb.	—	.85
ZE	lb.	—	.85
ZM	lb.	—	.85
Z-B-X	lb.	—	2.45
Zenite	lb.	.43½	.45½
A	lb.	.51½	.53½
Zenite Special	lb.	.44½	.46½
Zetax (uncoated)	lb.	.44½	.46½
Zimate, Butyl	lb.	—	1.03½
Zimate, Ethyl	lb.	—	1.03½
Zimate, Methyl	lb.	—	1.03½

ACTIVATORS

Blue Lead Sublimed (dlvd.)	lb.	.13¼	.14¼
Fish Oil, Hydrogenated, Fatty Acid			
Hydrofol Acid (dlvd.)	lb.	.10½	.15¼
Hyfac 430 (dlvd.)	lb.	.14	.15¼
Neo-Fat H.F.O. (dlvd.)	**lb.**	**.14½**	**.15¼**
Stearex Beads (dlvd.)	**lb.**	**.12**	**.13¼**
Lime, Hydrated			
Arrowhead	**ton**	—	**20.65**
Marblehead	ton	—	15.00
Sierra	ton	—	19.50
Litharge			
Eagle (dlvd.)	lb.	—	.1875
SB (dlvd.)	lb.	—	.1875
Magnesium Oxide, Heavy			
General Magnesite 500	lb.	.05	.06½
600	lb.	.06	.08
Michigan No. 15	**lb.**	**.0550**	**.0600**
Permanente	**lb.**	**.05**	**.06½**
Magnesium Oxide, Light			
Baker's (Neoprene Grade)	**lb.**	—	**.31**
General Magnesite (Neoprene Grade)	**lb.**	—	**.30**
General Magnesite No. 101	**lb.**	—	**.19**
General Magnesite Standard	**lb.**	—	**.22**
K & M (Neoprene Grade)	lb.	.30	.31
Maglite D	**lb.**	—	**.25**
M	lb.	—	.31
Marine's (Neoprene Grade) (l.c.l.)	lb.	—	.31
Michigan No. 30	lb.	—	.24
No. 40 Extra Light	lb.	—	.31
Witco Extra Light	lb.	.32	.35
Oleic Acid			
Emersol 210 (dlvd.)	lb.	.11¾	.14¾
L.C.P. Red Oil	lb.	.11¾	.14¾

ACTIVATORS (Cont'd)

Palm Oil Fatty Acid (c.l.)	**lb.**	**.11½**	**.14½**
Potassium Oleate (drums)	**lb.**	**.45**	**.55**
Red Lead			
Eagle	lb.	—	.1975
No. 2 RM (dlvd.)	lb.	—	.1975
Sodium Laurate, 75%	**lb.**	**.04**	**.74**
Sodium Oleate, 75%	**lb.**	**.45**	**.55**
Paste (drums)	**lb.**	—	**.20**
Sodium Stearate, 75%	**lb.**	**.45**	**.55**
USP Grade (drums)	**lb.**	—	**.37**
Stearic Acid, Single Pressed			
Emersol 110 (dlvd.)	lb.	.11½	.12¾
Groco 53	lb.	.11½	.12¾
Stearex B (dlvd.)	**lb.**	**.15½**	**.16¼**
Stearic Acid, Double Pressed			
Groco 54	lb.	.12	.13¼
Stearic Acid, Other			
Neo-Fat 1-58	**lb.**	**.1190**	**.1315**
1-60	**lb.**	**.1400**	**.1525**
1-65	**lb.**	**.1450**	**.1575**
White Lead Basic Carbonate	lb.	.1770	.1870
White Lead Basic Sulfate	lb.	.1919	.2019
Zinc Laurate			
Laurex	lb.	.26	.27
Zinc Stearate	lb.	.37	.39
Aquazinc	**lb.**	**.20**	**.35**

Unclassified Activators

Actifat (dms.)	**lb.**	—	**.18**
Aktone	lb.	.22	.23
Barak	lb.	—	.62
Curade	lb.	.57	.59
D-B-A	**lb.**	—	**1.95**
Dibutylamine (dlvd.)	lb.	.53	.55¾
MODX	lb.	.295	.345
Polyac	lb.	—	1.65½
Ridacto (drums)	lb.	.25	.26
Snodette (dlvd.)	lb.	.16	.17¼
SOAC (min. 10 dms.)	**cwt.**	—	**8.00**
Vulklor	**lb.**	**.75**	**.85**

ANTI-COAGULANTS

Anhydrous Ammonia (l.c.l.)	**lb.**	**.17**	**.21**
Aqua Ammonia (dms.)	lb.	.031	.035
M.B.M. (l.c.l.)	**lb.**	—	**.35**

ANTI-FOAMING AGENTS

Aero Anti Foam H	lb.	—	.20
Regular	lb.	—	.12
D.C. Antifoam A	**lb.**	**5.65**	**6.65**
Antifoam A Emulsion	lb.	2.30	4.00
Defoamer A-25	lb.	—	3.00
Deltyl Prime	lb.	.70	.82
Defoamer 630	lb.	—	.12½
Kessco X-3 (dms.)	lb.	—	.47¾
Modicol A	lb.	.12	.15
B	lb.	.35	.40
RS-968	lb.	.38	.38½
Terpinol Prime No. 1	lb.	.39	.54

ANTI-OXIDANTS

Agebest 1293-22A	lb.	1.90	2.00
Agerite Alba	lb.	2.27½	2.37½
Gel	lb.	.62	.64
Hipar	lb.	.94	.96
H. P.	lb.	.69½	.71½
Powder	lb.	.50½	.52½
Resin	lb.	.67	.69
Resin D	lb.	.50½	.52½
Stalite	lb.	.50½	.52½
White	lb.	1.45	1.55
Akroflex C	lb.	.69½	.71½
F	lb.	.69½	.71½
Aminox	lb.	.50½	.52½
Antioxidant 2246	lb.	1.65	1.68
Antox	lb.	.50½	.52½
Aranox	lb.	—	3.25
Benzoquinone	lb.	1.50	1.75
Betanox Special	lb.	.72½	.74½
B-L-E	lb.	.50½	.52½
Carvacrol	lb.	—	.78
Deenax	lb.	.95	1.05
Di-tert-Butyl-para-Cresol	lb.	.91	.95
Eugenol C-95%	lb.	3.34	3.54
Flectol H	lb.	.50½	.57½
Flexamine	lb.	.69½	.71½
Neozone A	lb.	.52½	.54½
C	lb.	—	.69½
D	lb.	.50½	.52½

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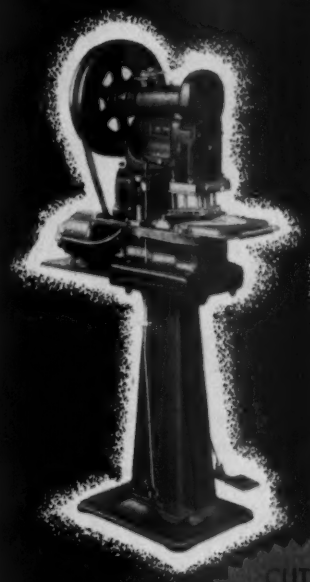

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ANTI-OXIDANTS (Cont'd)

Oxidex	lb.	——	3.60
PDA-10 and 20	lb.	.39	.41
Permalux	lb.	——	2.10
Resorcin, Tech. (dlvd.)	lb.	.82½	.83½
Santoflex AW	lb.	.75	.82
B	lb.	.50½	.57½
BX	lb.	.62	.69
35	lb.	.69½	.76½
Santovar-A	lb.	1.50	1.57
O	lb.	1.30	1.37
Santowhite Crystals	lb.	1.60	1.67
Santowhite L	lb.	.50½	.57½
MK	lb.	1.29	1.36
S.C.R. (tons)	lb.	.32	.34
Sequestrene AA	lb.	——	1.00
NA2	lb.	——	.82
NA3	lb.	——	.80
Stabilite	lb.	.53	.55
Alba	lb.	.72	.77
L	lb.	.53	.55
White	lb.	.49	.51
Stabilizer No. 1	lb.	——	1.55
Stabilizer No. 9-A	lb.	.80	1.05
Sunolite	lb.	.20	.23
Tannic Acid, Tech.	lb.	.46	.48
Thermoflex A	lb.	.98	1.00
V-G-B	lb.	.67	.69
Wing-Stay S	lb.	.49½	.50½

ANTI-SCORCHING AGENTS

Armeen HT	lb.	.34	.42
Benzoic Acid—Tech.	lb.	——	.43
Good-rite Vultrol	lb.	.60	.62
Sodium Acetate 60-62% Crystals	lb.	——	.06

ANTISEPTICS AND GERMICIDES

Arquad S	lb.	.22	.25
Formaldehyde (dms.)	lb.	.066	.071
G-4 (bbls.)	lb.	1.04	1.19
G-11	lb.	2.60	2.75
Nuodex 100 S.S. (dlvd.)	lb.	——	1.10
Nuodex 100 W.D. (dlvd.)	lb.	——	1.25
Nuodex Zinc 8% (dms.) (dlvd.)	lb.	.24	.28
Ortho Cresol (26°-27°)	lb.	——	.201
Retarder D	lb.	.42	.50
Soligen Drier—Copper 8% (dms.)	lb.	.23½	.24¼
Copper 6% (dms.)	lb.	.18¼	.19½
Zinc 8% (dms.)	lb.	.22¼	.23½
Zinc 8% (dms.)	lb.	——	.21¼
Vancide	lb.	——	.80

ANTI-WEBBING AGENTS (for Latex)

Webnix 34	lb.	1.50	2.25

AROMATICS (DEODORANTS)

Airkem 115	gal.	——	6.50
122	gal.	——	6.50
Alamasks	lb.	.50	6.50
Bouquet 149	lb.	——	3.00
Coumarin	lb.	——	2.75
Curodex 19	lb.	——	4.75
188	lb.	——	5.75
198	lb.	——	6.75
Deodorant 65	lb.	——	1.85
Deodorant L-37	lb.	2.00	2.40
L-44	lb.	2.50	2.90
N.L.T.X.	lb.	1.85	2.15
Deodorant Oil GD 3427	lb.	1.70	2.00
GD 6422	lb.	2.00	2.50
GD 6423	lb.	1.60	1.90
GD 6575	lb.	2.45	2.95
GD 31063	lb.	2.65	3.15
Latex Perfume 5	lb.	——	3.25
6	lb.	——	7.50
9	lb.	——	.65
Naugaromes (dms.)	lb.	1.50	3.00
Neutroleum Delta	lb.	——	2.60
Gamma	lb.	——	3.60
Parador A	lb.	1.95	2.25
C	lb.	2.75	3.25
E	lb.	.25	.55
GD 5280	lb.	2.00	2.50
GD 5348	lb.	1.90	3.25
Perfume Oil Bouquet Vanilla M	lb.	2.40	2.75
Rodo No. 0	lb.	4.00	4.50
No. 10	lb.	5.00	5.50
Rubbarome (dms.)	lb.	1.00	3.80
Rubber Perfume 12	lb.	——	2.85
Russian Leather 7	lb.	——	4.35
Vanillin	lb.	3.00	4.05

BLOWING AGENTS

Ammonium Bicarbonate (dlvd.)	lb.	.0725	.1075
Blowing Agent CP-975	lb.	——	.35
Sodium Bicarbonate, U.S.P. (c.l. bags)	cwt.	——	2.10
Sponge Paste	lb.	——	.20
Unicel	lb.	——	.82
ND	lb.	——	1.40
S	lb.	——	.20
Urea	lb.	.0425	.0475

BONDING AGENTS

Braze	gal.	6.00	7.50
Durez 12987	lb.	.48	.53
Kalabond	gal.	6.50	7.75
MD1	lb.	5.00	5.50
50	lb.	2.75	3.25
Penacolite B1A	lb.	——	.88

BONDING AGENTS (Cont'd)

Pliobond 20	gal.	2.91	4.23
30	gal.	3.63	4.97
Reanite	gal.	6.75	7.25
Rex Compounds	gal.	1.30	2.85
Ty-Ply Q (BN & S)	gal.	6.75	8.00

COAGULANTS

Acetic Acid—56% (bbls.)	cwt.	9.00	11.00
Glacial—99½% (bbls.)	cwt.	14.05	14.55
Calcium Nitrate, Tech., Crystals	lb.	.07	.17
Hydroxyacetic Acid—70% (dms.)	lb.	——	.084
Zinc Nitrate, Tech.	lb.	——	.22½

COLORING AGENTS

Black

Aquablak B (also M, R)	lb.	.08	.11¼
Aquablak S	lb.	.11	.11½
Black Shield 4-35 (dms.)	lb.	——	.0825
Carbon Black—*See Reinforcing Agents*			
Lampblack No. 10	lb.	.06	.09
Mapico Black Iron Oxide (50 lb. bags)	lb.	.11¼	.12
Pure Black Iron Oxide	cwt.	11.75	12.00

Blue

Blue GD, Dispersed	lb.	——	4.55
Blue GD Paste	lb.	——	1.80
Milori Blue	lb.	.45	.48
Monastral Fast Blue CPL	lb.	——	1.77
PCD, Dispersed	lb.	——	2.50
Ramapo Blue	lb.	3.40	3.45
Rubber Blue X-1999	lb.	——	1.70
Stan-Tone Blue	lb.	1.40	4.00
Ultramarine	lb.	.14	.30
Vansul Blue M.B.	lb.	.90	2.65
Victoria Blue BP-262-D	lb.	2.25	2.30

Brown

Brown Iron Oxide	lb.	.11¾	.12
Mapico Brown (50 lb. bags)	lb.	.12¾	.13

Green

Filo Green	lb.	——	.32
Green Chromium Oxide, Pure	lb.	.37½	.44½
Green Chromium Oxide, Pure, Hydrated	lb.	.95	1.05
Green FD, Dispersed	lb.	——	1.85
Monastral Fast Green GSD, Dispersed	lb.	——	3.20
GSL	lb.	——	1.97
Permansa Green CP-594	lb.	——	1.35
Pigment Green B	lb.	——	1.35
GL-652D	lb.	.88	.93
Ramapo Green	lb.	——	4.00
Rubber Green X-1292	lb.	——	1.15
Stan-Tone Green	lb.	1.50	3.30
Vansul Green M.B.	lb.	1.05	3.05

Maroon

Stan-Tone Maroon	lb.	3.00	3.05
Vansul Maroon M.B.	lb.	1.05	2.80

Orange

Molybdate Orange	lb.	——	.44
Orange FD, Dispersed	lb.	——	2.75
Rubber Orange X-2065	lb.	——	3.00
Stan-Tone Orange	lb.	1.65	4.00
Vansul Orange M.B.	lb.	2.25	2.60

Red

Antimony Trisulfide	lb.	.72	.78
R. M. P. Sultur Free	lb.	——	.78
R. M. P. No. 3	lb.	——	.72
Cadmium Red	lb.	.95	1.25
Cadmolith Red (bbls.)	lb.	1.75	2.00
Graphic Red (dlvd.)	lb.	——	.85
Indian Red, American, Pure	lb.	.12¼	.12½
Doxco (English)	lb.	.11½	.11¾
Mapico Reds (50 lb. bags)	lb.	.1225	.1250
Oximony Iron Oxide	lb.	——	.09
Red Iron Oxide, Light	lb.	.12¼	.12½
Red PBD, Dispersed	lb.	——	1.75
2BD, Dispersed	lb.	——	1.80
2BL	lb.	——	1.32
PBL	lb.	——	1.65
Rubanox Red CP-762 (dlvd.)	lb.	——	1.40
Rubber Red CP-339 (dlvd.)	lb.	——	1.10
Rubber Red X-1148	lb.	——	.85
Rubbered	lb.	.1150	.1175
Solfast Red	lb.	1.40	1.95
Stan-Tone Red	lb.	1.10	3.05
Sun Burnt Red	lb.	.1150	.1175
Vansul Red M.B.	lb.	.95	3.40
Watchung Red	lb.	——	1.95

White—Lithopone

Albalith	lb.	.0750	.0850
Cryptone BT	lb.	.10	.11
Eagle	lb.	.06¼	.06½
Permolith	lb.	.0790	.0890
Ponolith	lb.	.0790	.0865
Sunolith	lb.	.0790	.0865

COLORING AGENTS (Cont'd)

White—Titanium Pigments

Ti-Cal	lb.	.08	.08¾
Ti-Pure	lb.	.21	.24
Titanox A—all grades (dlvd.)	lb.	.21	.22
RA (dlvd.)	lb.	.23	.24
RA-10 (dlvd.)	lb.	.23	.24
RA-NC (dlvd.)	lb.	.23	.24
RC (dlvd.)	lb.	.08¼	.08¾
RC-HT (dlvd.)	lb.	.08	.08½
Unitane O-220	lb.	.195	.205
OR-250	lb.	.215	.225
Zopaque	lb.	.21	.22

White—Zinc Oxide (American Process)

AZO-ZZZ 11 (and 22, 23, 44, 55)	lb.	.1475	.1575
Eagle	lb.	.1475	.1575
Horse Head Special	lb.	.1475	.1575
XX Red	lb.	.1475	.1575
XX-505	lb.	.1625	.1725
Protox 166	lb.	.1475	.1575
167	lb.	.1475	.1575
St. Joe Black Label	lb.	.1475	.1575
Green Label	lb.	.1475	.1575
Red Label	lb.	.1475	.1575

White—Zinc Oxide (Dispersed)

Dispersed Zinc Oxide	lb.	——	13

White—Zinc Oxide (French Process)

AZO-ZZZ 66	lb.	.1700	.1800
Eagle Green Seal	lb.	.1650	.1750
Eagle Red Seal	lb.	.1600	.1700
Eagle White Seal	lb.	.1700	.1800
Florence Green Seal	lb.	.1650	.1750
Red Seal	lb.	.1600	.1700
White Seal	lb.	.1700	.1800
Kadox 25	lb.	.1700	.1800
Kadox 15, 17 and 72	lb.	.1475	.1575
U. S. P. 12	lb.	.1800	.1900

White—Zinc Sulfide

Cryptone ZS-800	lb.	.2530	.2630

Yellow

Benzidine Yellow	lb.	1.91	2.15
Cadmolith Yellow (bbls.)	lb.	——	1.27
Chrome Yellow	lb.	——	.31
Iron Oxide, Pure	lb.	.10	.10¼
Mapico Yellow (50 lb. bags)	lb.	.1000	.1025
Rubber Yellow X-1940	lb.	——	2.15
Stan-Tone Yellow	lb.	1.00	2.25
Toluidine Yellow	lb.	——	1.91
YL-556-D	lb.	——	.82
Oximony Iron Oxide	lb.	——	.06¾
Vansul Yellow M.B.	lb.	1.05	1.85
Yellow GD, Dispersed	lb.	——	2.15
GL	lb.	——	1.62
Zinc Yellow	lb.	——	.25

DISPERSING AGENTS

Anchoid*	lb.	.24	.25
Armeen 18	lb.	.42	.50
Blancol Conc. Powder	lb.	.15½	.17½
Darvan No. 1 (and No. 2)	lb.	.22	.30
Daxad 11 (21, 23)	lb.	.08	.35
Dispersaid	lb.	1.25	1.35
Furala	lb.	.06½	.07½
Halloid	lb.	.04½	.05½
Lomar PW	lb.	——	.16
Marasperse C	lb.	.06½	.06¾
CB	lb.	.12¼	.13¼
N	lb.	.09½	.10½
Modicol C	lb.	.08	.12
Rubbex	lb.	.267	.285
Stan-Chem BQC	lb.	.12¼	.17¼
1067	lb.	——	.13½
1471	lb.	.1687	.2187
2251	lb.	.12¼	.17¼
Trenamine D-25	lb.	.32½	.36
Triethanolamine (drums) (dlvd.)	lb.	.24½	.27½
Yelkin TT	lb.	.14	.18
Zinsper	lb.	——	.15

EXTENDERS

Advagum 1098	lb.	——	.64
Arco 1071-13B	lb.	.14½	.15½
1073-18B	lb.	.13½	.14½
1294-36B	lb.	.11½	.12½
Bunaweld Polymer No. 780	lb.	——	.22
No. 5514	lb.	——	.35
D-92 (and D-93) (dms.)	lb.	——	.12
Car-Bel-Ex-A	lb.	——	.14
Extender 600	lb.	——	.1480
Polyco 418	lb.	.17	.18
PR-162 Latex Extender	gal.	——	1.55
Synprolac	lb.	.16	.23
Synprowax	lb.	——	.23
Vistanex	lb.	——	.32

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FILLERS (Inert and Reinforcing)

Abrasives			
Carbonite	lb.	.19½	1.30
Lionite	lb.	.14	1.20
Pumice	lb.	.03	.05
Aluminum Hydrate	lb.	.07	.10
Aluminum Silicate			
Marter White	ton	18.50	30.00
Barium Carbonate (l.c.l.)	ton	72.50	90.00
Barytes			
No. 1 Floated, White	ton	37.85	53.60
No. 2 Floated, Unbleached	ton	35.85	51.60
No. 22 Barytes (c.l.)	ton	——	20.00
Foam A	ton	——	37.60
Bentonite (c.l.)	ton	——	12.50
Argosite Clay (c.l.)	ton	——	12.50
Bennett Clay (c.l.)	ton	——	32.50
SPV Volclay (c.l.)	ton	——	12.50
Blanc Fixe	ton	72.50	120.00
Calcium Carbonate			
Atomite (c.l.)	ton	——	30.00
B.I. White No. 1 (c.l.)	ton	——	7.50
B.I. White No. 2 (c.l.)	ton	——	7.00
Blue Star XX	ton	——	15.50
Calcene TM	ton	75.00	95.00
Caltec	ton	40.00	57.50
Calwhite	ton	——	17.00
Camelwite	ton	——	30.00
Gamaco	ton	——	30.00
Kalite (c.l.)	ton	——	50.00
Laminar	ton	——	30.00
Lesamite (c.l.)	ton	——	27.50
Millical (c.l.)	ton	——	32.50
Multifex	ton	——	120.00
M	ton	——	110.00
Non-Fer-Al	ton	——	25.00
Purecal D	ton	51.75	66.75
M	ton	46.50	66.75
T	ton	110.00	125.00
U	ton	120.00	135.00
Sierracal	ton	15.00	18.50
Super Multifex	ton	——	160.00
Surfex (c.l.)	ton	——	35.00
Suspenso (c.l.)	ton	——	30.00
Witcarb B	ton	51.75	66.75
P	ton	110.00	125.00
R	ton	120.00	135.00
R-12	ton	46.50	66.75
York White	ton	——	9.50
Calcium Silicate			
Silene EF	ton	120.00	140.00
Calcium Sulfate, Anhydrous			
Snow White Filler	ton	——	20.50
Calcium Sulfate, Hydrous			
Terra Alba No. 1	ton	12.00	14.40
Chalk Whiting (l.c.l.)	lb.	.0150	.0175
Recco Paris Whiting	ton	——	33.00
Clay			
Aiken Clay	ton	——	14.00
Alsilite (c.l.)	ton	20.00	45.00
Alsite (c.l.)	ton	——	14.00
Aluminum Flake	ton	17.00	60.00
Buca (c.l.)	ton	——	45.00
Burgess No. 20	ton	——	35.00
No. 30	ton	——	37.00
Burgess Iceberg	ton	——	50.00
Burgess Polyclay	ton	——	45.00
Catalpo (c.l.)	ton	——	35.00
Champion	ton	——	14.00
C.S.D. (c.l.)	ton	——	13.50
Crown	ton	——	14.00
Dixie (c.l.)	ton	——	14.00
Hi-White R	ton	——	13.50
Hydratex R	ton	——	30.00
Kaolloid Clay (c.l.)	ton	——	10.50
Markham (c.l.)	ton	14.00	35.00
McNamee (c.l.)	ton	——	13.50
Oldham (c.l.)	ton	13.50	35.00
Paragon	ton	——	13.50
Pigment 5	ton	21.85	36.00
Pigment 22	ton	17.00	22.50
Pigment 33	ton	——	37.00
Recco (c.l.)	ton	——	14.00
RX-43	ton	——	33.00
Stan-Clay	ton	25.00	30.00
Stellar-R	ton	——	50.00
Suprex	ton	——	14.00
Whitetex (c.l.)	ton	——	50.00
Diatomaceous Earth	ton	30.00	50.00
Kaylorite (c.l.)	ton	——	30.00
Lorite	ton	——	30.00
Flock			
Cotton, white and colored	lb.	.13	.33
Filfloc F 40-9000	lb.	——	.16
Filfloc F 6000	lb.	——	.40
Polycel	ton	110.00	210.00
Rayon, bleached or dyed	lb.	.87	1.50
Rayon, grey	lb.	——	.18
Rayon, pink	lb.	——	.18
Solka-Floc (l.c.l.)	lb.	.07	.16
Glue, Bone (dlvd.)	lb.	.18	.20½
Leather, Shredded	lb.	.05	.17
Lignin	lb.	.03	.06
Indulin	lb.	.09	.10
Limestone, Pulverized	ton	3.25	10.00
Georgia Marble No. 10	ton	——	10.00
Industrial Filler No. 100	ton	——	5.75
Micro Velva	ton	43.00	48.00
Velvet Filler, Superfine	ton	——	27.00
Magnesium Carbonate	lb.	.0950	.1050
K & M Clearcarb	lb.	.1225	.1275
Magnesium Oxide	lb.	.05	.06

FILLERS (Cont'd)

Magnesium Silicate	ton	18.00	35.00
Airex	ton	25.00	27.00
Asbestol	ton	——	25.00
Blue Star Talc	ton	——	23.00
L.S. Silver	ton	23.50	25.50
Sierra White	ton	21.25	23.25
Mica	lb.	.01¼	.07½
Concord	lb.	.07	.07½
Micro-Mica	lb.	.06½	.07½
Mineralite (c.l.)	ton	25.00	85.00
Silversheen	lb.	.07¼	.08
Triple A Mica (c.l.)	ton	——	25.00
Vermiculite	lb.	——	.11
Wet Ground Biotite Mica	lb.	.05½	.06¼
Wet Ground Mica No. 160	lb.	.07	.07½
Pyrophyllite			
Pyrax A (c.l.)	ton	——	13.50
WA (c.l.)	ton	——	16.00
Silica	ton	16.00	27.00
Blue Star	ton	——	20.60
Slate, Powdered (l.c.l.)	ton	15.00	20.00
Talc, Domestic	ton	10.00	27.00
Nytal 200	ton	——	25.00
300	ton	——	36.00
Walnut Shell Flour	ton	45.00	111.00
Whiting, Commercial	ton	——	7.00
Camel-Carb	ton	——	10.00
C-C-O White	ton	——	18.00
Georgia Marble No. 15	ton	——	15.00
No. 16	ton	——	16.00
Keystone (c.l.)	ton	——	16.00
Rambo No. 1 White	ton	——	8.50
No. 6 White	ton	——	9.00
Snowflake (c.l.)	ton	——	18.00
Veroc (c.l.)	ton	——	8.50
Welco (c.l.)	ton	——	8.50
York White R (c.l.)	ton	——	8.50
Wood Flour	ton	22.00	49.00

FINISHING MATERIALS, SURFACE

Beaco Finishes	gal.	2.10	2.35
Black Out	gal.	4.50	8.00
Shellac, Orange Gum	lb.	.40	.45
VanWax	gal.	1.45	1.50

FLAME RETARDANTS

Celluflux	lb.	.36½	.38½
Chlorinated Paraffin 42	lb.	——	.14¾
Chlorowax 70	lb.	.18	.19
Halowax	lb.	.27	.42
Zinc Borate 3167	lb.	.1920	.2020
Zyrox	lb.	.49	.78

LUBRICANTS, MOLD

Aquadag	lb.	3.50	4.00
Aquarex D	lb.	——	.80
I	lb.	——	.94
MDL	lb.	——	.33
WAQ	lb.	——	.28
Akro Gel	lb.	——	.165
Borax, Granular (l.c.l.)	ton	81.00	86.00
Carbowax 4000	lb.	.33	.34
CD Mold Release A	gal.	——	7.00
Colite Concentrate (dms.)	gal.	——	.90
Concentrex	lb.	——	.25
D.C. 7 Compound	lb.	5.25	6.50
D.C. Emulsion No. 7	lb.	1.90	2.32
No. 35	lb.	1.59	3.50
No. 35A	lb.	1.59	3.50
No. 35B	lb.	1.59	3.50
D.C. Mold Release Fluid	lb.	3.70	6.00
Dipex	lb.	.14	.18
Dri-Lube	lb.	——	.22
Glydag	lb.	1.30	2.00
Hawkeye Flake (dlvd.)	lb.	——	.11
Kokobace	lb.	——	.12
Lubrex	lb.	.25	.30
Lubri-Flo	gal.	10.00	12.00
Migralube	lb.	——	.35
Mold Lubricant No. 72			
Conc.	gal.	2.50	4.00
No. 735	gal.	1.26	2.75
No. 769	gal.	1.20	2.60
Moldeze No. 3	gal.	5.00	6.00
Mold-Brite	gal.	——	1.50
Mold-Slick	lb.	.253	.271
Mold-White	gal.	——	2.00
Monopole Oil MD	lb.	——	.23
Nopcolube	lb.	——	.15
Orvus WA Paste (dms.)	lb.	——	.26
Prodag	lb.	.28	.42
Purity Flake (dlvd.)	lb.	——	.13
Rubber-Flo	gal.	1.25	1.60
Rubber-Glo	gal.	——	.94
Rusco Mold Paste	lb.	——	.25
Sericite (l.c.l.)	ton	65.00	75.00
Thermalube	lb.	——	.13¾
Ucon Lubricants	lb.	.28	.37
Ulco Mold Soap	lb.	.12	.23

LUBRICANTS, RUBBER

Diglycol Stearate Neutral (and SE) (dms.)	lb.	——	.25
Extrud-o-Lube	gal.	——	1.54
G.B. Naphthenic Neutrals	gal.	.11	.18
Latex-Lube GR (dlvd.)	lb.	.19¼	.20
Pigmented (dlvd.)	lb.	.18¾	.19½
RS	lb.	——	.16½
Liqui-Lube (dlvd.)	lb.	——	.16¼
NF (dlvd.)	lb.	——	.16¾
NT (dlvd.)	lb.	——	.16¾
Propylene Stearate (dms.)	lb.	.68	.78

LUBRICANTS, RUBBER SURFACE

Barium Stearate	lb.	.37	.39
Calcium Stearate	lb.	.35	.37
D.C. 4 Compound	lb.	5.13	6.50
D.C. 200 Fluid	lb.	3.70	6.00
Glycerized Lubricant	gal.	——	1.48
Hydro-Zinc	lb.	——	.20
Polyethylene Glycol	lb.	.26½	.29
Rexanol	lb.	——	.13
Separex	lb.	——	.25
Stock-Lube	lb.	——	.19
Slab-Dip	lb.	——	.15
Wet-Zinc	lb.	——	.22¼
Zinc Stearate	lb.	.37	.39
Z.S.D. Dispersion	lb.	——	.20

MOLD CLEANERS

Actusol (dlvd.)	gal.	1.45	1.65
Alkon (dlvd.)	lb.	.16	.16½
Metso 99	cwt.	4.00	5.85
Granular	cwt.	3.50	5.15
Rubber-Sol	gal.	2.97	3.97
Shelblast	ton	80.00	140.00
Sprex A.C. (dlvd.)	lb.	.17¾	.18¾

PEPTIZING AGENTS

Peptizer P-12	lb.	.84	1.00
Pepton 22	lb.	.74½	.77½
RPA 2	lb.	——	.77½
3	lb.	——	.47½
3-RO	lb.	——	.50½
5	lb.	——	.59

PLASTICIZERS & SOFTENERS

AA (dms.)	lb.	.26	.27½
Acto 500	lb.	——	.09
Adipol BCA (dms.)	lb.	.45½	.46
2EH	lb.	.47½	.48½
10A	lb.	.47½	.48½
ODY	lb.	.51¾	.52¾
American Pine Tar	lb.	.0410	.0678
Arneel	lb.	.22	.27
Arolene 1980 (c.l.)	lb.	——	.10
Aromatic Tar	gal.	.0573	.1973
Bardol	lb.	.02½	.03½
B	lb.	.05¾	.06
Bayol D	gal.	——	.382
F	gal.	——	.52
Beeswax, Bleached	lb.	.85	.90
Yellow Refined	lb.	.70	.75
Bondogen	lb.	.55	.60
B.R.C. No. 20	lb.	.0150	.0160
B.R.H. 2	lb.	.0280	.0290
BRS 700	lb.	.0175	.0260
B.R.T. 3	lb.	.024	.025
4	lb.	.0225	.0235
7	lb.	.0265	.0275
B.R.V.	lb.	.0350	.0515
Bunarex Resins	lb.	.06½	.07½
Bunatak AH	lb.	.08	.09
U	lb.	——	.17½
No. 90	lb.	——	.09
No. 210	lb.	——	.14
Burgundy Pitch	lb.	.0843	.0888
Butac	lb.	.10½	.11½
Butoxyethyl Diglycol Carbonate	lb.	.40	.41
Butyl Benzyl Sebacate	lb.	.61	.63¾
Butyl Carbitol Perlargonate (dms.)	lb.	——	.64
Butyl Cellosolve Perlargonate (dms.)	lb.	——	.68
Butyl Palmitate	lb.	——	.26½
Butyl Roleate	lb.	.176	.18
Butyl Stearate-CP (dms.)	lb.	.31	.32
BWH-1	lb.	——	.14
Cabflex Di-BA (dms.)	lb.	.42	.44¾
Di-OA (dms.)	lb.	.43½	.46¼
Di-OP (dms.)	lb.	.40	.42¾
Califlux 510, 550	lb.	.025	.0325
G.P.	lb.	.0125	.02
R-100	lb.	.04½	.05¼
TF	lb.	.02	.02¾
Candelilla Wax Prime	lb.	.67	.75
Capryl Benzyl Sebacate	lb.	.67½	.70¼
Carbonex	lb.	.0325	.0375
S Flakes	lb.	.04	.0475
S Plastic	lb.	.0410	.0460
644	lb.	.0375	.0425
Carbowax 4000 (drums)	lb.	.33	.34
Cardolite 615	lb.	.33¾	.36¾
816	lb.	.25¾	.28¾
Carnauba Wax, Crude	lb.	.95	1.10
Refined	lb.	.87	.94
Substitute	lb.	.45	1.08
Yellow	lb.	1.15	1.20
Celluflex (dms.)	lb.	.34	.35
Ceresine Wax	lb.	1.4	.26
Chlorowax 40	lb.	.14	.14¾
Contogum	lb.	.06¼	.10¼
CTLA Polymer	gal.	.17½	.32½
Cumar Resins	lb.	.05½	.14½
D.C. 200 Fluid	lb.	4.14	6.00
D.B.M.	lb.	——	.30
Degras, Common	lb.	——	.12
Dibenzyl Sebacate	lb.	.74	.76¾
Dibutoxethyl Sebacate	lb.	——	.5634
Dibutyl Phthalate	lb.	.36	.41¾
Dibutyl Sebacate—Tech.	lb.	.59	.61¾
C.P.	lb.	.61	.63¾
Dicapryl Adipate	lb.	.40½	.43¼

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PLASTICIZERS & SOFTENERS (Cont'd)

Dicapryl Phthalate	lb.	.37 -	.39¼
Dicapryl Sebacate	lb.	.61½ -	.64¼
Di-Carbitol Phthalate (dms.)	lb.	.42 -	.42½
Dicyclohexyl Phthalate	lb.	— -	.42
Diethyl Phthalate (t.c.)	lb.	.29½ -	.32¼
Di-2-ethlyhexyl Phthalate (t.c.)		— -	.37
Dihexyl Adipate	lb.	.33 -	.35¼
Dihexyl Phthalate	lb.	.28½ -	.31¼
Dihexyl Sebacate	lb.	.50 -	.52¼
Di Isobutyi Azelate (dms.)	lb.	.54 -	.57
Di-iso-octyl Adipate (dms.)	lb.	.40½ -	.43¼
Di-iso-octyl Phthalate (t.c.)	lb.	.37 -	.39¼
Dimethyl Phthalate (t.c.)	lb.	.29¼ -	.30¾
Dimethyl Sebacate	lb.	.77 -	.79¼
Dinopol		.42¼ -	.43¾
Dioctyl Phthalate (dms.)	lb.	.41¼ -	.42¾
Dioctyl Sebacate (dms.)	lb.	.62½ -	.65¼
D.I.O.P. (dms.)	lb.	.41¾ -	.42¾
Dipolymer Oil	gal.	— -	.55
Dispersing Oil No. 10	lb.	.05½ -	.05¾
Dutrex B	lb.	.02¾ -	.03¼
5 and 6	lb.	.020 -	.031
15E	gal.	.10 -	.20
20, 21, 22 and 25	lb.	— -	.04
Elastex 10-P	lb.	.40 -	.42½
50-B	lb.	.34½ -	.37
DCHP	lb.	.42½ -	.43½
Estac	lb.	— -	.16
Ethox (dms.)	lb.	.45½ -	.45¾
Flexol B-400	lb.	.28 -	.30
DHP	lb.	.46 -	.48¾
DOP	lb.	.40 -	.42¾
TOF	lb.	.49 -	.51¾
3GH	lb.	.44 -	.46
3GO	lb.	.53 -	.55
4GO	lb.	.37 -	.39¼
8HP	lb.	.40 -	.42¾
Flexricin P-1 (and 4)	lb.	— -	.36
P-4C	lb.	— -	.46½
P-8	lb.	— -	.36
Pale 4	lb.	.28 -	.29½
Galex W-100	lb.	.15½ -	.19¼
G. B. Light Process Oil	lb.	.025 -	.0325
Medium Process Oil	lb.	.03½ -	.04¼
G. B. Naphthenic Neutrals	gal.	.11 -	.18
Good-Rite GP233	lb.	.45¾ -	.48½
GP261	lb.	.40 -	.42¾
Harflex 500 (dms.)	lb.	.36½ -	.39¼
Hercolyn (dlvd.)	lb.	.20 -	.20½
Herron-H.T.	gal.	.16 -	.27
Herron-Plas	lb.	— -	.03¾
Herron-Wax	lb.	.05¼ -	.06
No. 23	lb.	.08¼ -	.08¾
No. 24	lb.	.07¾ -	.07¾
HSC No. 13	lb.	.27 -	.30
Hylene B	lb.	.45 -	.50
C	lb.	.41 -	.46
D	lb.	.47½ -	.52½
Indonex 632½ (633½, 634½, 638½)	gal.	.1100 -	.1700
Kapsol	lb.	.34 -	.35
Kenflex	lb.	.19 -	.27
Kessoflex 101 (dms.)	lb.	— -	.39
102 (dms.)	lb.	— -	.32½
103 (dms.)	lb.	— -	.41½
104 (dms.)	lb.	— -	.48
105 (dms.)	lb.	— -	.33¼
105 (dms.)	lb.	— -	.35½
KP 23 (dms.)	lb.	.31 -	.32
120 (dms.)	lb.	.31 -	.32
140 (dms.)	lb.	.4774 -	.4825
201	lb.	.54¼ -	.55¼
504	lb.	.35¾ -	.36¼
555	lb.	.33 -	.33½
Kremol 40	gal.	.36 -	.46
Kremol 40	gal.	.39 -	.49
50	gal.	.39 -	.49
Kronisol (drums)	lb.	.38¼ -	.39¼
Kronitex (drums)	lb.	.37¼ -	.38¼
Lanolin, Tech. Anydrous	lb.	.21 -	.23
Lead Oleate	lb.	— -	.30½
Lindol (dms.)	lb.	.34 -	.35
2-Mercaptoethanol (drums)	lb.	1.25 -	1.50
Methox (dms.)	lb.	.41¼ -	.41¾
Methyl Laurate	lb.	.25 -	.27
Methyl Oleate	lb.	— -	.20
Methyl Stearate (dms.)	lb.	— -	.30
Modicol G	lb.	— -	.23
R	lb.	— -	.17
Montan Wax, Crude	lb.	.15 -	.18
Monten Wax	lb.	.12 -	.13
Monty Wax	lb.	— -	.30½
Morflex No. 100	lb.	.37 -	.38¾
Natac	lb.	.10 -	.11
Nebony Resins (dms.)	lb.	.04 -	.04½
Neolene 210 (t.c.)	lb.	— -	.16
212 (t.c.)	lb.	— -	.14
220 (t.c.)	lb.	— -	.15
Nerium	lb.	— -	.09
Nevillac Resins (dms.)	lb.	.28 -	.55
Neville Resins (dms.)	lb.	.12 -	.18
Nevindene Resins (dms.)	lb.	.15 -	.18
Nevinol (dms.)	lb.	— -	.20
Nevoll	lb.	.02½ -	.03½
Nevtex 10 (dms.)	lb.	.11 -	.12½
Nuba 1 (and 2) (dms.)	lb.	.05¾ -	.06¼
3X (dms.)	lb.	.07¾ -	.08¼
15 (and 30) Oil (dms.)	lb.	.36¼ -	.38
No. 480 Oil Proof Resin	lb.	— -	.18
Ohopex Q10 (dms.)	lb.	.40¾ -	.41¾
Opalwax	lb.	.37 -	.38
Ortho-Nitrobiphenyl	lb.	.06 -	.11
Ozokerite Wax No. 64 White	lb.	.31 -	.32
Yellow	lb.	.25 -	.26

PLASTICIZERS & SOFTENERS (Cont'd)

Palm Oil	lb.	— -	.11
Paradene Resins (dms.)	lb.	.06½ -	.07½
Para Flux (dms.)	gal.	.1925 -	.2025
2016 (dms.)	gal.	.22 -	.23
Para Lube (l.c.l.)	lb.	.046 -	.048
Parmo	lb.	.06 -	.13½
Pepton 22	lb.	.72 -	.75
PG-16 (drums)	lb.	— -	.22¼
Picco 10 (and 25)	lb.	— -	.13½
75 (and 100)	lb.	— -	.13
Rubber Resin 100	lb.	.1855 -	.1905
S.O.S.	gal.	— -	.29
Piccocizer 30	lb.	— -	.05½
Piccolastic A (and B, C, D, E)	lb.	.28½ -	.29
F1, FHF and FX	lb.	— -	.1815
T-135	lb.	.22¾ -	.23¼
Piccolyte S Resins	lb.	.18½ -	.20
Piccolyte WW Resins	lb.	.45 -	.47
Piccoumaron Resins	lb.	.06¾ -	.17
Piccovar	lb.	.14½ -	.15
Piccovol	lb.	— -	.02½
Pictar	gal.	— -	.25
Pigmentar	lb.	.0410 -	.0678
Pigmentaroil	lb.	.0410 -	.0678
Plastac M	lb.	— -	.09¼
Plasticizer 2286	lb.	— -	.26¼
Plasticizer SC	lb.	.49 -	.52
Plasticizer W-13	lb.	.37 -	.38¾
Plasticizer XP-3	lb.	— -	.50
Plastoflex 50	lb.	.34 -	.38
55	lb.	.34 -	.38
520	lb.	.37½ -	.38½
VS	lb.	.40 -	.43
Plastogen		.07¾ -	.08
Plastolein 9050 (c.l.)	lb.	.59¼ -	.62¼
9055	lb.	.37½ -	.40½
9058	lb.	.57 -	.60
9250	lb.	.27 -	.30
9715	lb.	.37½ -	.40½
Plastone	lb.	.27 -	.30
Polycin 781	lb.	.40 -	.41
Polyco 438	lb.	.34 -	.36
Polymel C-128	lb.	.19½ -	.20½
D	lb.	.22 -	.24
H-2	lb.	.22 -	.24
6	lb.	.06¾ -	.10
7	gal.	.23 -	.28
Process Oil C-255 (c.l.)	gal.	— -	.22
Propylene Stearate (dms.)	lb.	— -	.32
PT 400 Pine tar (600, 800) (t.c., dms.)	lb.	.0410 -	.0534
PX-104	lb.	.34 -	.42
PX-108	lb.	.38 -	.46
PX-208	lb.	.41½ -	.49
PX-404	lb.	.60 -	.68
Reogen	lb.	.13¼ -	.13½
465 Resin (dms.)	lb.	.07 -	.07½
Resin 731-C	cwt.	— -	15.00
Resin C	lb.	.0200 -	.0285
Resinex	lb.	.03¾ -	.03¾
L-4	lb.	.02¼ -	.03
Rexflex	lb.	— -	.15
Rosin Oil	gal.	.54 -	1.20
R.P.A. No. 2	lb.	— -	.65
No. 3	lb.	— -	.46
No. 5	lb.	— -	.57
R.S.O. Softening Oil	lb.	.03 -	.05
Rubberol	lb.	— -	.25¾
Rubtar	gal.	— -	.40
Santicizer B-16	lb.	.50 -	.52
E-15	lb.	.47 -	.49
M-17	lb.	.44 -	.46
No. 107	lb.	.40 -	.42½
No. 140	lb.	.29 -	.31
No. 141	lb.	.40 -	.42½
No. 160	lb.	.34 -	.36
Sherolatum	lb.	.03½ -	.06
Softener No. 20	gal.	.09 -	.25
Staflex IXA	lb.	.34 -	.36
Stanolind Petrolatum	lb.	.048 -	.086
Wax	lb.	.31 -	.32¾
Staybelite Resin (dms.)	cwt.	— -	12.00
Sunny South Burgundy Pitch	lb.	.0980 -	.1025
Sunny South Pine Tar	lb.	.0410 -	.0678
Sunny South Rosin Oil	gal.	.58 -	.87½
Superla Wax	lb.	.27¾ -	.32
Syncera Wax	lb.	.19 -	.24
Syn Tac (c.l.)	gal.	— -	.33
Synthetic Revertant Oil	lb.	— -	.16
Tar, Refined	gal.	.12 -	.17
K-Tarnel NR (t.c.)	lb.	— -	.0851
Terpene A	gal.	— -	.65
TP-90B	lb.	— -	.59
TP-95	lb.	— -	.65
TP-98	lb.	— -	.65
Triacetin	lb.	.34 -	.45
Tricresyl Phosphate (t.c.)	lb.	— -	.35
Turgum S	lb.	.08¾ -	.09¾
Vanadiset A	gal.	.13 -	.20
Vistac No. 1	gal.	1.00 -	1.16
P	lb.	.18 -	.18½
Vopcolene 50	lb.	— -	.37
Witresin—Granular	ton	41.00 -	43.00
Solid	ton	36.00 -	38.00

PROCESSING AIDS

Calcium Riconoleate	lb.	— -	.57
Castor Oil, Processed (dms.)	lb.	— -	.35¼
Refined (drums)	lb.	— -	.19¼
Castorwax (min. 250 lbs.)	lb.	— -	.27¾
Dutrex 7	lb.	.12 -	.20
ELA	lb.	— -	.80
Millrex	lb.	— -	.15

PROCESSING AIDS (Cont'd)

Polycin 783	lb.	— -	.31½
Resin No. 510	lb.	.13½ -	.16½
Zyrox	lb.	.50 -	.79

PROTECTIVE & STABILIZING AGENTS

Acacia	lb.	.12¾ -	.21
Alpha Protein	lb.	.24 -	.28
Ammonium Alginate	lb.	— -	.95
Aroostoocrat		— -	.07½
Carob Bean Flour	lb.	— -	.46
Casein	lb.	.28 -	.38
Ethylene Diamine 68%	lb.	.47 -	.50
Karaya Gum	lb.	.20 -	.50
Prosein	lb.	.0600 -	.0630
Rex Compound No. 2801	lb.	— -	.15
Stablex B	lb.	.50 -	.95
K	lb.	.27 -	.35

RECLAIMING AGENTS

Armeen C	lb.	.50 -	.58
T	lb.	.42 -	.50
No. 517 H.B. Oil	gal.	.11½ -	.16½
535	gal.	.22 -	.27
C-6 Oil (and 28, 32)	gal.	.33 -	.38
C-10 Oil	gal.	.25 -	.30
C-33 Oil	gal.	— -	.21½
Caustic Soda—Flake 76% (c.l., drums)	cwt.	— -	3.75
Liquid 50% (t.c.)	cwt.	— -	2.55
Solid 76% (c.l., dms.)	cwt.	— -	3.35
Cresylic Acid (99-100%)	gal.	1.20 -	1.39
D-4	gal.	— -	.27
E-5	gal.	— -	.25
G. B. Reclaiming Oil	gal.	.12 -	.18
CD-10	gal.	.10 -	.16
CD-50-U	gal.	.18 -	.24
Gensol No. 6 (t.c.)	gal.	— -	.45
Heavy Aromatic Naphtha	gal.	— -	.12¼
LX-77 Reclaiming Solvent	gal.	.21 -	.33
LX-572 Reclaiming Oil	gal.	.27 -	.32
LX-777 Reclaiming Oil	gal.	.23 -	.33
Neo-Fat D-242	lb.	.05½ -	.07¾
PRR 1	gal.	.15 -	.35
PT 67 Light pine oil	gal.	.50 -	.60
PT 101 Pine tar oil	lb.	.0410 -	.0534
Q Oil	gal.	— -	.286
Reclaiming Oil 1621	lb.	.03 -	.04
Reclaiming Oil 3186 (t.c.)	gal.	.28 -	.38½
Reclaiming Oil 3186-G	gal.	.25 -	.36½
Reclaiming Reagent No. 4	lb.	.12 -	.15
R.P.A. No. 3	lb.	— -	.46
RR-10	lb.	— -	.35
Soda Ash (c.l., bags)	cwt.	— -	1.50
Solvenol 1 (dms.)		— -	.60
Solvent 534	gal.	.20½ -	.26½
Solvent Oil 21	gal.	.24 -	.29
C-42	gal.	.23 -	.28
Union Solvent 4060-O	gal.	— -	.149
X-1 Resinous Oil	lb.	.0210 -	.0275

REINFORCING AGENTS—CARBON BLACK

Channel, Hard Processing (HPC) (bags)

Atlantic HPC-98	lb.	.0740 -	.1225
Continental F	lb.	.0740 -	.1225
Croflex	lb.	.0740 -	.1225
Dixiedensed (and S)	lb.	.0740 -	.1225
Kosmobile (and S)	lb.	.0740 -	.1225
Micronex HPC	lb.	.0740 -	.1225
Spheron 4	lb.	.0740 -	.1225
Witco Disperso No. 6	lb.	.0740 -	.1225

Channel, Medium Processing (MPC) (bags)

Atlantic MPC-95	lb.	.0740 -	.1225
Continental A	lb.	.0740 -	.1225
Croflex TH	lb.	.0740 -	.1225
Dixiedensed HM (and S-66)	lb.	.0740 -	.1225
Huber Arrow TX	lb.	.0740 -	.1225
Kosmobile HM (and S-66)	lb.	.0740 -	.1225
Micronex Standard	lb.	.0740 -	.1225
Spheron 6	lb.	.0740 -	.1225
Texas M	lb.	.0740 -	.1225
Witco Disperso No. 1	lb.	.0740 -	.1225

Channel, Easy Processing (EPC) (bags)

Atlantic EPC E-42	lb.	.0740 -	.1225
Continental AA	lb.	.0740 -	.1225
Croflex 77	lb.	.0740 -	.1225
Dixiedensed 77	lb.	.0740 -	.1225
Kosmobile 77	lb.	.0740 -	.1225
Micronex W-6	lb.	.0740 -	.1225
Spheron 9	lb.	.0740 -	.1225
Texas E	lb.	.0740 -	.1225
Witco Disperso No. 12	lb.	.0740 -	.1225
Wyex	lb.	.0740 -	.1225

Channel, Conductive (CC) (bags)

Continental R-40	lb.	.1800 -	.2400
Dixie 5 Dustless	lb.	.0950 -	.1550
Dixie Voltex	lb.	.1950 -	.2500
Kosmink Dustless	lb.	.0950 -	.1550
Kosmos Voltex	lb.	.1950 -	.2500
Spheron C	lb.	.1400 -	.1850
Spheron N	lb.	.2500 -	.3000
Voltex	lb.	.1950 -	.2500

Conductive Furnace Black (CFB) (bags)

Shawinigan Acetylene Black	lb.	.1600 -	.2200
Vulcan C	lb.	— -	.1100

Furnace, Fast Extruding (FEF) (bags)

Arovel	lb.	.0600 -	.1000
Croflex 50	lb.	.0600 -	.1000
Dixie 50	lb.	.0600 -	.1000
Kosmos 50	lb.	.0600 -	.1000
Statex M	lb.	.0600 -	.1000
Sterling SO	lb.	.0600 -	.1000

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REINFORCING AGENTS—CARBON BLACK (Cont'd)

Furnace, General Purpose (GPF) (bags)

Sterling V	lb.	.0500 -	.0900

Furnace, High Modulus (HMF) (bags)

Collocarb	lb.	.0550 -	.0950
Continex HMF	lb.	.0550 -	.0950
Croflex 40	lb.	.0550 -	.0950
Dixie 40	lb.	.0550 -	.0950
Kosmos 40	lb.	.0550 -	.0950
Modulex	lb.	.0550 -	.0950
Statex 93	lb.	.0550 -	.0950
930	lb.	.0550 -	.0950
Sterling L	lb.	.0550 -	.0950

Furnace, Medium Abrasion (MAF) (bags)

Philblack A	lb.	.0600 -	.1000

Furnace, Semi-Reinforcing (SRF) (bags)

Continex SRF	lb.	.0400 -	.0800
Croflex 20	lb.	.0400 -	.0800
Dixie 20	lb.	.0400 -	.0800
Essex	lb.	.0400 -	.0800
Furnex	lb.	.0400 -	.0800
Gastex	lb.	.0450 -	.0850
Kosmos 20	lb.	.0400 -	.0800
Pelletex	lb.	.0400 -	.0800
Sterling NS	lb.	.0400 -	.0800
Sterling R	lb.	.0450 -	.0850
Sterling S	lb.	.0400 -	.0800

Furnace, Fine (FF) (bags)

Statex B	lb.	.0650 -	.1050
Sterling 99	lb.	.0650 -	.1050

Furnace, High Abrasion (HAF) (bags)

Aromex	lb.	.0790 -	.1250
115	lb.	.0890 -	.1290
Continex HAF	lb.	.0790 -	.1250
Croflex 60	lb.	.0790 -	.1175
Dixie 60	lb.	.0790 -	.1175
Kosmos 60	lb.	.0790 -	.1175
Philblack O	lb.	.0790 -	.1190
Statex R	lb.	.0790 -	.1250
Vulcan 3	lb.	.0790 -	.1220

Furnace, Super Abrasion (SAF) (bags)

Statex 125	lb.	.1100 -	.1550

Thermal, Fine (FT) bags)

P-33 (c.l.)	lb.	— -	.0550

Thermal, Medium (MT) (bags)

Thermax (c.l.)	lb.	— -	.0350
Thermax, Stainless (c.l.)	lb.	— -	.0450

REINFORCING AGENTS—SILICA

Hi-Sil	lb.	.10 -	.11½

REINFORCING AGENTS—MISCELLANEOUS

Darex Copolymer No. 3	lb.	.47 -	.49
X34	lb.	.42 -	.44
X43 (and 43E)	lb.	.42 -	.44
Darex Copolymer Latex No. 3-L (and X34L)	lb.	.36½ -	.39
Durez 12687 (and 12707)	lb.	— -	.37
Durez 13355	lb.	— -	.29½
Good-Rite Resin 50	lb.	.42 -	.44
Kralac A	lb.	.43 -	.44
Marbon S and S-1	lb.	.42 -	.49
8000	lb.	.42 -	.49
Marmix	lb.	.42 -	.49
Pliolite Latex 190	lb.	.30 -	.34
Pliolite NR	lb.	.74 -	.76
Pliolite S3, S6, and S6B	lb.	.42 -	.44
C-3 Masterbatch	lb.	.57 -	.64
C-4 Masterbatch	lb.	.55 -	.62
G Masterbatch	lb.	.44 -	.51
G50 Masterbatch	lb.	.44 -	.51
N Masterbatch	lb.	.48 -	.55
R Masterbatch	lb.	.62 -	.69
WA	lb.	.68 -	.75
S113V76	lb.	.48 -	.55
Polyco 220	lb.	.22 -	.23

RETARDERS

Dutch Boy Normasal	lb.	— -	.46
ESEN	lb.	.35 -	.37
Retarder ASA	lb.	— -	.57
Retarder PD	lb.	.35 -	.37
Retarder T.C.M.	lb.	— -	.65
Retarder W	lb.	— -	.44½
Retardex	lb.	.47 -	.50

RUBBER SUBSTITUTES

Mineral Rubber

38	ton	38.00 -	40.00
Black Diamond	ton	38.00 -	40.00
Byerlyte	ton	47.00 -	54.00
Gilsonite, Selects (c.l.)	ton	37.00 -	38.00
Hard Hydrocarbon (dms.)	ton	46.50 -	48.50
Herron Flake	ton	— -	45.00
Mineral Rubber, solid	ton	42.50 -	44.50
Pioneer	ton	35.00 -	46.00

Vulcanized Vegetable Oils (Factice)

Amberex	lb.	.29 -	.36
Brown	lb.	.1425 -	.2680
Dispersed	lb.	.26 -	.42
Neophax	lb.	.1570 -	.2680
White	lb.	.1440 -	.2850

Miscellaneous Rubber Substitutes

G.B. Asphaltenes	lb.	.06 -	.06½
Gilsowax B	lb.	.09 -	.11
Resin No. 1098 (drums)	lb.	— -	.62
No. 1198	lb.	.46¾ -	.49¾

SOLVENTS

Acetone (dlvd.)	lb.	.08½ -	.11
American Dipentine	gal.	.44½ -	.68
American Pine Oil	gal.	.75½ -	.95½
Amsco-Lactol Spirits (t.c.)	gal.	— -	.18
Rubber Solvent (t.c.)	gal.	— -	.17
Solv A (t.c.)	gal.	— -	.25½
Solv A-80 (t.c.)	gal.	— -	.30½
Solv B (t.c.)	gal.	— -	.29
Solv B-90 (t.c.)	gal.	— -	.32
Solv D (t.c.)	gal.	— -	.30½
Special Naphthalite (t.c.)	gal.	— -	.17
Textile Spirits (t.c.)	gal.	— -	.18
Amyl Chlorides, Mixed (l.c.l.) (drums)	lb.	.10 -	.11
Benzol 90%	gal.	— -	.48
Butyl Acetate (t.c.)	lb.	.15¼ -	.17¾
Butyl Alcohol (t.c.)	lb.	.13 -	.175
Secondary (dlvd.)	lb.	.11 -	.13½
Tertiary (dlvd.)	lb.	.12 -	.14½
Carbon Bisulfide, Tech.	lb.	.0440 -	.0800
Carbon Tetrachloride	lb.	.08 -	.08½
Cosol 1	gal.	.37 -	.43
Cosol 2	gal.	.42 -	.48
Cyclohexane	lb.	.09¼ -	.11¾
Cyclohexanone	lb.	.25 -	.27
Diacetone, Pure (dlvd.)	lb.	.12 -	.14½
Dichlorethyl Ether (dms.)	lb.	.15 -	.17
Formal (dms.)	lb.	.29¼ -	.31¼
Dichloropentane (l.c.l.)	lb.	.04 -	.07
Dicom	gal.	.30 -	.42
Dipentene (dms.)	gal.	— -	.60
Halowax Oil	lb.	.28 -	.41
Heptanes (t.c.)	gal.	.17 -	.22
Hexalin Cyclohexanol	lb.	.20 -	.22
Hexanes (t.c.)	gal.	.17 -	.22
Isopropyl Alcohol, Ref. 99% (dlvd.)	gal.	.43 -	.60
Ether, Ref. (dlvd.)	gal.	.05 -	.07½
Mesityl Oxide (dlvd.)	lb.	.11½ -	.14
Methyl Acetone, Syn. (dms., dlvd.)	gal.	.54½ -	.72¼
Methyl Ethyl Ketone	lb.	.11 -	.13½
Methyl Isobutyl Ketone (dlvd.)	lb.	.13 -	.15½
N-5 Pentane Mix. (t.c.)	gal.	— -	.13½
N-6 Hexanes (t.c.)	gal.	— -	.14½
N-7 Hexanes (t.c.)	gal.	— -	.13½
Penetrell	gal.	.44½ -	.68
Petrolene (t.c.)	gal.	— -	.13125
Picolines, Alpha, Refined	lb.	— -	.40
Mixed	lb.	— -	.30
Proprietary Alcohol (t.c.)	gal.	— -	.43½
Pyridine, Refined	lb.	— -	1.05
Quinoline	lb.	— -	.61¼
Rubber Solvent (t.c.)	gal.	— -	.16
Rubsol (t.c.)	gal.	— -	.11875
Skellysolve B (Hexanes) (t.c.)	gal.	— -	.148
C (Heptanes) (t.c.)	gal.	— -	.141
E (Octanes) (t.c.)	gal.	— -	.155
R (Solvent Naphtha)	gal.	— -	.114
Solvenol (dms.)	gal.	— -	.36
Solvent, Crude, Light	gal.	.19 -	.28
Solvesso 100 (t.c.)	gal.	— -	.28
150 (t.c.)	gal.	— -	.28
Sunny South Dipentine	gal.	.44½ -	.68
Sunny South Pine Oil	gal.	.75½ -	.95½
Sunray	gal.	.1140 -	.1600
Toluene (drums)	gal.	— -	.28
Toluol (t.c.)	gal.	— -	.45
Trichlorethane	lb.	.11½ -	.13½
Triglycol Dichloride (dms.)	lb.	.59½ -	.60½
Union Thinner 1	gal.	— -	.163
3	gal.	— -	.165
5	gal.	— -	.45
7	gal.	— -	.153
2-50-W Hi-Flash	gal.	— -	.41
X-7 Sp. Heptanes (t.c.)	gal.	— -	.11
Xylol	gal.	— -	.45

STABILIZING AGENTS (for Vinyl Resins)

Basic Silicate White Lead	lb.	.1535 -	.1635
No. 201	lb.	.20¼ -	.21¼
Bunatak Polymer No. 780	lb.	— -	.04
No. 5514	lb.	— -	.35
BVS	lb.	— -	.74¾
Cadmium Stearate	lb.	— -	1.25
Dutch Boy DS-207	lb.	— -	.56
Plumb-O-Sil A	lb.	— -	.31¼
B	lb.	— -	.32¾
Trihase	lb.	— -	.29¼
Dythal	lb.	— -	.42½
Lead Stearate, Precip.	lb.	.36 -	.38
Fused	lb.	— -	.35½
Lithium Stearate	lb.	.63 -	.65
Stabelan E	lb.	1.25 -	1.40
XL	lb.	.55 -	.65
Stabilizer No. 3	lb.	— -	2.15
Stabilizer No. 21	lb.	— -	1.08
Stabilizer No. 52	lb.	— -	2.15
Stabilizer No. 89	lb.	— -	.75
Stabilizer No. 143	lb.	— -	.85
Stabilizer BC-12	lb.	— -	.90
Stabilizer B-5	lb.	— -	.70
Stabilizer CH-14	lb.	— -	.65
Stabilizer E6B	lb.	— -	.95
Stabilizer JCX	lb.	— -	.68
Stabilizer L	lb.	— -	.60
Stabilizer OM-10	lb.	— -	2.15
Stabilizer OM-18	lb.	— -	3.65
Stabilizer SN	lb.	— -	.48
Stabilizer V-1-N	lb.	— -	.45
Stabilizer V-9	lb.	— -	.85
Stabilizer VL-2	lb.	— -	1.27
Stabilizer VL-3	lb.	— -	1.18

STABILIZING AGENTS (Cont'd)

Stabilizer V-7939	lb.	— -	.60
Staycin 1	lb.	— -	.65
Vanstay L	lb.	.33 -	.35
H	lb.	.75 -	.77
HH	lb.	.98 -	1.00

SUN CHECKING AGENTS

Antisol	lb.	— -	.23
Antisun	lb.	— -	.21
Heliozone	lb.	.26 -	.27
NBC	lb.	— -	1.50
Sharples Wax	lb.	.23 -	.28
Sunolite	lb.	.20 -	.23
Sunproof	lb.	.25 -	.26
Imp.	lb.	.23 -	.24
Jr.	lb.	.18 -	.19
Tonox	lb.	.51½ -	.53½

TACKIFIERS

Arcco 620-32B	lb.	.20 -	.21
716-30	lb.	.19½ -	.20½
1041-21	lb.	.17½ -	.18½
Galex (drums)	lb.	.15½ -	.19¼
Indopol H-300	gal.	1.00 -	1.16
Koresin	lb.	.73 -	.75
Liquid Rubber Flux	lb.	— -	.14
Nilox (c.l.)	cwt.	— -	15.00
Pentalyn A (dlvd.)	lb.	.16 -	.16½
Resin V	lb.	— -	.23¼
Rubtack	lb.	— -	.12
Staybelite Ester No. 10 (dlvd.)	lb.	.24 -	.24½
Synthol	lb.	— -	.24¾
Vistac No. 1	gal.	1.00 -	1.16
A	lb.	.21½ -	.22¼
Zirex (c.l.)	cwt.	— -	15.00

THICKENERS (FOR LATEX)

Alcogum AN-6	lb.	— -	.85
AN-10	lb.	— -	.08½
Betanol (drums)	lb.	— -	.75
Emulsorex No. 5	lb.	— -	.35
Lecithin	lb.	.12 -	.17
Modicol VD	lb.	— -	.12½
VE	lb.	— -	.10¼
VF	lb.	— -	.10¾
VK	lb.	— -	.07
Polyco 296	lb.	.15 -	.16
296-N	lb.	.15 -	.16
Propylene Laurate (dms.)	lb.	.57 -	.67
Sodium Silicate	cwt.	1.50 -	2.65

VULCANIZING AGENTS

Selenium

Ancasal*	lb.	— -	2.00
Vandex	lb.	— -	3.50

Sulfur

Blackbird	cwt.	— -	2.30
Crystex	lb.	.19½ -	.23
Darex Dispersed Sulphur	lb.	.12 -	.17
Devil (c.l.)	cwt.	— -	1.75
Dispersed Sulfur	lb.	.12½ -	.14½
Insoluble Sulfur 60	lb.	.12½ -	.13
Spider	cwt.	— -	2.30
Star (c.l.)	cwt.	— -	2.25
Tire (c.l.)	cwt.	— -	1.75
Tube	cwt.	— -	2.25
Vultac 2	lb.	.47 -	.49
3	lb.	.51 -	.53

Tellurium

Ancatel*	lb.	— -	2.00
Telloy	lb.	— -	2.50

WETTING AGENTS

Advawet No. 10	lb.	— -	.20
No. 15	lb.	— -	.21½
No. 33	lb.	— -	.48
Aerosol OT 70% Clear	lb.	.80 -	1.00
Alrosol (dms.)	lb.	— -	.40
Alrosperse	lb.	— -	.18
Amarex D	lb.	— -	.80
MDL Paste	lb.	— -	.33
ME	lb.	— -	.97
NS	lb.	— -	.60
WA Paste	lb.	— -	.56
Areskap 50	lb.	.30 -	.38
Dry 100	lb.	.60 -	.72
Aresket 240	lb.	.30 -	.38
Dry 300	lb.	.60 -	.72
Aresklene 375	lb.	.42 -	.57
Dry 400	lb.	.70 -	.84
Armacs	lb.	.29 -	.76
Arquads	lb.	.21 -	.61
Etho-chemicals	lb.	.34 -	.80
Kessco E-122 (dms.)	lb.	— -	.49
Lecithin	lb.	.18 -	.86
Modicol L	lb.	— -	.58
N	lb.	— -	.40
S	lb.	— -	.32
Nekal NS	lb.	— -	.28
Nopco 1086-A	lb.	.42 -	.50
1187-X	lb.	— -	.14½
Parnol	lb.	.13 -	.18
Santomerse D	lb.	.44 -	.65
S	lb.	.13 -	.25
Soranon SB	lb.	.14 -	.15
SF Conc.	lb.	.29 -	.30
Sorbit P	lb.	— -	.25
Stablex G	lb.	.50 -	.70
Tergitol 4 (dms., dlvd.)	lb.	.30 -	.31
7 (dms., dlvd.)	lb.	.42 -	.43
08 (dms., dlvd.)	lb.	.30 -	.31
P28 (dms., dlvd.)	lb.	.18½ -	.19
Trenamine W-30	lb.	— -	.15
Vultamol	lb.	— -	.17½
Wetsit Conc.	lb.	.25 -	.32

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EXECUTIVE-RUBBER-CHEMICAL ENGINEER desires to relocate. Proven factory manager and technical director. Over twenty years experience management, selling, research and development compounding, production, engineering design and costing of mechanical and chemical blown sponge rubber. Experience includes molded and extruded, special engineered mechanicals, drug sundries and automotive sponge and mechanical parts. Consulting and Manufacturers Agent proposals will be given careful consideration. Address Box 495-P, RUBBER AGE.

SALES MANAGER Desires Change. Particularly interested in the challenge of introducing new products. Many years experience in the rubber and leather industries, selling to shoe manufacturers and other trades. Address Box 502-P, RUBBER AGE.

TECHNICAL SALES. Broad background rubber and vinyl compounding. Desire technical service position. Well acquainted with trade. Will travel or relocate. Resume on request. Address Box 501-P, RUBBER AGE.

Scandinavian General Chemist—corresp. M.S. with 2 years laboratory and factory experience mechanical rubber goods, emigrating to U. S. November, seeks position with progressive organization. Address Box 506-P, RUBBER AGE.

PLANT SUPERINTENDENT, CHEMIST, 6 years experience in management and production. Familiar with natural rubber and latex, vinyls, synthetic rubbers and latices, adhesives and combining cements. Can handle people; laboratory and factory coordination. Reliable, steady. Address Box 507-P, RUBBER AGE.

LATEX CHEMIST

Interested research and development. Ph.D. Over ten years experience. Address Box 509-P, RUBBER AGE.

CHEMIST, B.S., young, single, presentable, with two years' experience in rubber and plastics formulation and compounding for extrusion and molding, desires sales position with a progressive concern. Location immaterial. Address Box 511-P, RUBBER AGE.

SALESMAN with excellent following is looking for a position to sell RUBBER SLABS, FOAM, SOLES, etc., to the Shoe Manufacturers in New England. Address Box 513-P, RUBBER AGE.

RESEARCH compound chemist seeking new position. Fifteen years research, development and factory compounding tires, tubes and related items. Available for technical sales or product development. Address Box 514-P, RUBBER AGE.

CHEMIST, B.S.—Seven years experience in manufacture of tubes and tires, laboratory and practical factory experience in tire development, desires responsible position with progressive firm in technical or sales line. Good personality and appearance. Address Box 515-P, RUBBER AGE.

HELP WANTED

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HELP WANTED (Continued)

RUBBER TECHNOLOGIST—CHEMIST OR CHEMICAL ENGINEER

Large Eastern supplier has opening for permanent position in its Rubber Laboratory for recent college graduate with up to five years' industrial experience in mechanical goods, sundries, wire, tires, or latex. Practical experience in factory processing and compounding essential so that laboratory results can be readily interpreted and demonstrated to customers. Position offers excellent opportunities for advancement in either sales or development compounding. Progressive management encourages publication of experimental work. This, coupled with laboratory having finest equipment and staffed with highest type of trained technicians, assures successful applicant of ample opportunity to demonstrate ingenuity and ability. Position also offers opportunity for some travel and for contacts with the rubber industry. Write giving in full detail, age, education, and experience. Replies held strictly confidential. Our employees know of ths ad. Address Box 491-W, RUBBER AGE.

LATEX FOAM CHEMIST: Exceptional opportunity and good profitable future with large manufacturing company of nationally known latex foam products. Must have thorough knowledge of foam rubber chemistry, plant engineering and set up, continuous line rubber production equipment (including Hobart & Oakes Machinery) and problem servicing. Salary open and will be commensurate with experience and proven ability. Permanent solid future for right man. Give complete resume stating age, experience, education, salary, etc. Replies will be kept in strictest confidence. Our organization knows of this advertisement. Address Box 510-W, RUBBER AGE.

CHEMIST for research and development work on solvent and latex adhesives with a growing California company. State age, experience, present salary, marital status in first reply. Address Box 497-W, RUBBER AGE.

RUBBER CHEMIST for small New Jersey Molded, Extruded and Lathe Cut Soft Rubber Plant. In excellent resort area location. Kindly furnish full particulars with application. Address Box 498-W, RUBBER AGE.

RUBBER TECHNOLOGIST—TECHNICAL SALES SERVICE

Large eastern chemical manufacturer has technical sales service opening in synthetic rubber and rubber chemicals. Age 25 to 35. Several years experience in rubber manufacture. College degree. Foreign languages, preferably German and French. Should be willing to make headquarters in Europe. Excellent opportunity in rapidly expanding field. Write giving in full detail age, education and experience. Replies held strictly confidential. Our employees know of this ad. Address Box 496-W, RUBBER AGE.

TIME STUDY MAN for New Jersey plant, employing approximately 125 people. Located in attractive resort area. Man must be able to assume responsibility for time study as well as for methods and similar allied jobs. Good opportunity for right man. Kindly furnish photograph along with application. Address Box 504-W, RUBBER AGE.

CHEMICAL ENGINEER OR CHEMIST with experience in compounding and processing of synthetic and natural rubber. Position available requires this background to qualify for technical service and promotional activities with major chemical company servicing the rubber industry. Applicant with technical service experience is preferred—replies will be held strictly confidential. Address Box 505-W, RUBBER AGE.

HELP WANTED—Continued

HELP WANTED in reducing tear, increasing building tack in GR-S? Recent advances in compounding with Purecal (Wyandotte's precipitated calcium carbonate, whitest extender known) warrant cost comparison with cheapest natural rubber formulas. For samples, data and consultation, write us. Wyandotte Chemicals Corporation, Calcium Carbonate Sales Dept., Wyandotte, Michigan.

RUBBER CHEMIST—New England manufacturer of rubber footwear has an opening for a rubber chemist, experienced in development and manufacturing. Must have complete knowledge of formulating compounds, factory processing and laboratory control. Write giving detailed resume, salary expected. Our staff has knowledge of this ad. Address Box 512-W, RUBBER AGE.

ADHESIVE MANUFACTURER offers unusual opportunity for man with technical and sales experience in rubber-based adhesives and latex for the position of TECHNICAL SALES DIRECTOR. RUBBER & ASBESTOS CORPORATION, 225 Belleville Avenue, Bloomfield, N. J.

WANTED: Latex Chemist for laboratory work. Must have BS Degree or equivalent and at least two years experience. Firm located in general vicinity of Wilmington, Delaware. Write, giving full particulars. Address Box 519-W, RUBBER AGE.

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WANTED: Source for uncured extruded stock in Eastern area. Steady weekly supply of approximately 1000 lbs. required. Address Box 517-B, RUBBER AGE.

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WANTED: 1 Model "A2S" Coulter Volumetric Press with stripper. Must be in good condition. Address Box 499-E, RUBBER AGE.

WANTED: 1 used reversed roll coating machine that will coat up to 54" in width and in thickness from 1 mill upwards. Must be in A-1 condition. Address Box 500-E, RUBBER AGE.

WANTED—LARGE AUTOCLAVE. We will buy a used autoclave approximately 6 ft. diameter and 16 to 30 ft. long. Please advise what you have and price immediately. MOLDED PRODUCTS, INC., Cockeysville, Maryland.

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WANTED: One 10" extruder, good condition, and one Scott tensile tester. Address Box 221-E, RUBBER AGE.

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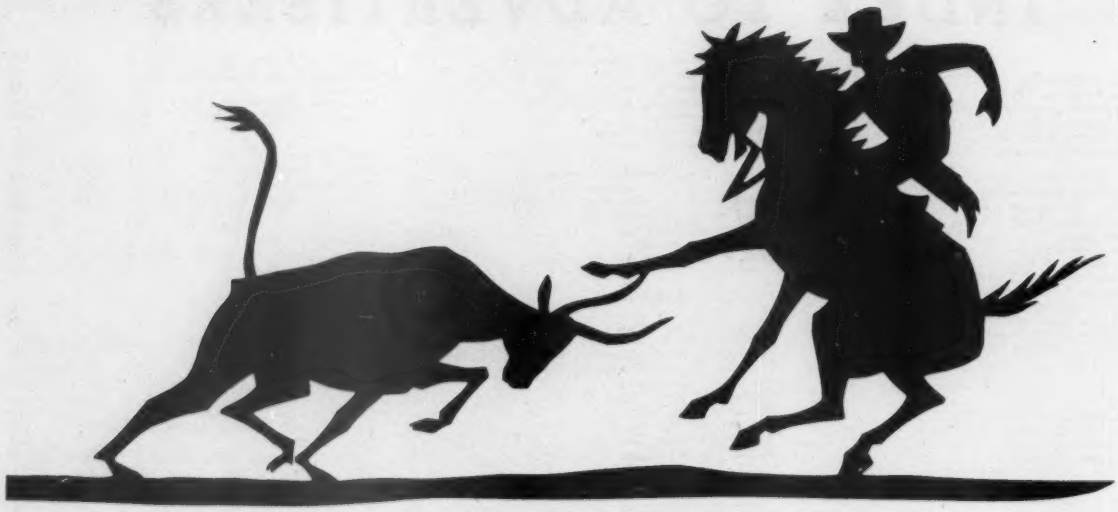

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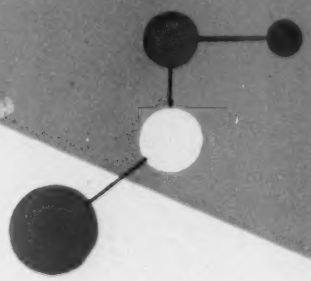

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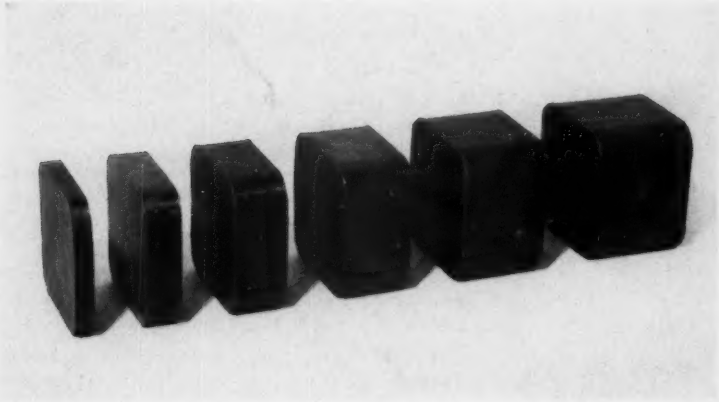

...check your September-October VANDERBILT NEWS (Vol. 18, No. 5) for information on the use of these accelerators in thick-section vulcanization

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